JOURNAL

OF THE

FRANKLIN INSTITUTE

OF THE

State of Pennsylvania,

DEVOTED TO THE

MECHANIC ARTS, MANUFACTURES, GENERAL SCIENCE,

AND THE RECORDING OF

AMERICAN AND OTHER PATENTED INVENTIONS.

NOVEMBER, 1830.

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN JULY, AUGUST, AND SEPTEMBER, 1830.

With Remarks and Exemplifications, by the Editor.

1. For a *Machine to Cleanse Grain from Foreign Substances;* Jesse Neal, Middlebury, Portage county, Ohio, assignee of Phineas Pettia, of Akron, in the same county, July 2.

An inclined floor, or trough, which may be made 12 feet long and two wide, and have ledges, or sides, of eight inches in width, on each side of it, is to be so fixed in a frame that a traversing motion may be given to it, endways, by means of a crank, or pitman. Upon this floor the grain is to be rubbed, which operation is thus effected. Pieces of timber, called followers, are to be cut in lengths equal to the width of the trough; they may be six inches wide, and five thick; these are to be laid across the trough about four inches apart, and retained in their places by blocks of wood projecting downwards from an upper frame, and passing between their ends.

The grain to be cleaned is fed on to the upper end of the trough, and when the proper motion is given the grain descends, passes successively under all the followers, and at the bottom is received upon a screen.

The claim is to a machine constructed on the general principles of the foregoing, which admits of variations in the particular arrangement, whilst the machine may be essentially the same.

2. For an improvement in the *Loom for Weaving Casinet and other Cloths;* James Hammond and John M'Clelland, Williamsport, Washington county, Pennsylvania, July 3.

This improvement consists in making such a connexion between three or four looms that one may with facility work the whole. The general construction of the looms is unchanged, but the three or four which are to be worked together, stand behind each other, in one common frame. Jointed connecting rods unite the slays of each loom, by passing through mortises made in the swords. One pair of treadles is made to work all the harness, by lines passing over their respective carriages; and so of the plucking stick, and other parts.

The claim is to "the manner of connecting together three or more looms by the connecting rods, in such a manner that one weaver can work many looms together with the same facility as he has heretofore been able to work one. Also the cords of the prickers, and the mode of constructing the carriages for the pulleys."

---

3. For a new and useful improvement in *Flouring Mills;* Jonathan Thompson, Ashtabula, Ashtabula county, Ohio, July 7.

This "Flouring Mill," adds another to the list of those grist mills which are sufficiently small to be portable, and in which stones of a very diminutive size are to be employed. The patentee proposes to give motion to both stones, but to move them with different velocities. The spindle of the lower stone is to be a tube, from which arms project out at right angles for the purpose of attaching the stone to it. The lower end of this tube rests upon a step, within which it runs; this step is perforated, to allow the spindle of the upper stone to pass through it, and through the tubular shaft or spindle of the lower stone. Upon each of these spindles is a whirl, each of which may be turned by a strap from a drum, such an arrangement being made as shall reverse their motions.

The straps are to be kept of a uniform tightness by means of tightening pulleys, which are borne up against them by a weighted lever.

The upper stone is to be pressed down by weights, as, in small light stones of the description intended to be used, the gravity of the stone itself would be inadequate to the effect which it is intended to produce. This pressure is to be made by means of a transverse beam, in the middle of which, on its lower side, is a metal box, to receive the end of the spindle of the upper stone. The ends of the transverse beam slide in mortises, to allow of its elevation or depression. It is drawn down upon the stone by weighted levers at each end, acting upon it through the medium of cords, or chains attached on its lower side.

The advantages said to arise from moving both stones, with different velocities, "are to increase the motion, and facilitate the grinding, and to prevent entirely the possibility of the clogging of the stones by the dampness of the grain, or from other causes. Both

stones being in motion, no particle of grain can remain stationary and impede the progress of others, but all are hurried to the circumference with exceeding briskness."

The manner of loading is considered as superior to any other; and the tightening of the straps by means of pulleys, is also mentioned as a very advantageous arrangement.

There is no *direct* claim to any part, and were we to *infer* what is meant to be claimed, it is the running of both stones with different velocities, the manner of loading the upper stone, and the mode of tightening the straps.

The running of both stones has been patented more than once, and we see nothing in the "different velocities," which offers any advantage over the moving them with the same velocities.

The arrangement for pressing down the upper stone is undoubtedly good, but this may be readily done, and, indeed has been done, by other means producing the same effect. If the particular method described is superior to those which have preceded it, this certainly must be deemed an improvement.

With respect to the pulleys for tightening the bands, however good they may be, they have no claim to novelty, and a patent based upon the use of them, could not be sustained.

We have given more space to the description of this apparatus than we usually spare for such a purpose; our reason for so doing is, that a small efficient grist mill, afforded at a moderate price, and driven by a power within the command of every farmer, is a desideratum; and we wish to point out to patentees the necessity of designating particularly what is really new in their machines, of claiming this distinctly, and of carefully avoiding to claim too much.

---

4. For a "*Self-adjusting Rail-road and Street Car;*" John Pollock, Hopewell, Chester county, Pennsylvania, July 7.

In the next number it is intended to give the specification of this car.

---

5. For an improvement in *Looms;* John Goulding, Dedham, Norfolk county, Massachusetts, July 7.

The improved apparatus cannot be described in words, we therefore shall give no more than the claim, which will show what is intended to be effected.

"What I claim as my invention, is, the method herein described, by which may be ascertained if the filling, or weft, breaks while running off from the bobbins, or the bobbins deliver all off, and by which ever cause of its so breaking, or running off, the loom will be stopped by the apparatus above specified."

---

6. For *Revolving Planes, and Sections of Rail-ways,* to be used in cross and branch rail-ways, and common roads crossing the same; Jonas P. Fairlamb, Newcastle county, Delaware, July 7.

The whole specification is comprised in the following words.

"I provide a circular plane, moveable at pleasure upon its centre, resting upon rollers, and moved by a pivot wheel geared into its face, or other cogs, placed in said horizontal circular plane, upon which plane I construct rail-ways corresponding and uniting, as moved around, with the rail-ways in any given direction;—the manner of using the plane is manifest; when a carriage is about to cross either way, nothing more is necessary than to place the rail-way on said plane to unite with the rail-road in the required direction. If it is required to change the direction of the carriage, not crossing the rail-road, the carriage must be received on said platform, and then all moves round together to the given direction."

"J. P. Fairlamb."

The foregoing plan we believe to be new, and, for single carriages, we think that it will answer well; but a revolving platform cannot be made sufficiently large to extend it beyond this use. But trains of carriages will be generally employed, and as each carriage would have to rest upon the platform, and be turned alone into the required direction, the trouble and delay must form a serious objection to its use. There is certainly room for better modes than any yet adopted, both for crossings for rail-roads, and bridges for canals.

---

7. For an improved *Mode of Fastening and Unfastening Window Blinds*, called a "Horizontal Spring Catch for Blinds;" William Phelps, Salem, Essex county, Massachusetts, July 7.

A catch made of iron, or other suitable material, with a spiral spring attached to it, is to be fastened to the lower rail of the blind; this is to catch upon a hook to keep it open, and upon a pin to keep it closed; the manner of doing this so nearly resembles many of those which are now, or were formerly, in use, that we know not upon what the claim to invention is founded.

---

8. For an improvement in the mode of *Breaking and Dressing Hemp and Flax, and of Thrashing Grain;* David Ball, Fort Edward, Washington county, New York, July 7.

The hemp or flax to be broken and dressed is to pass between several pairs of rollers of different constructions. In the drawing which accompanies the specification, six pairs are represented. The first pair have coarse flutes, the second are fluted more finely, the third are called open rollers, and consist of bars instead of flutes, so that the shives may fall through; the fourth are similar to the last, but finer; the fifth have fine angular flutes to hold the fibres firmly, and are called holding rollers; the sixth are called spring rollers; the bars or beaters of these recede from their peripheries towards the centre, and are borne out by springs: there are cams which, as these rollers revolve, force the beaters in, and allow them to spring out upon the fibres just as they are passing between them; their motion is very rapid, as they are intended to whip the flax clean.

When used as a thrashing machine, the upper row of rollers is to be removed, and an apparatus, figured in the drawing, is to cause the lower rollers to act on the grain. We cannot pretend to give a clear idea of the parts we have mentioned, without the drawing. They are well described and represented, and the claim is in the following terms.

"The parts which I claim are the *spring rollers*, and *open rollers*, of whatever materials they may be made; and also the *break* for thrashing; and the application of them to breaking, dressing, or thrashing, hemp, flax, or grain, or to acting upon any thing else."

---

9. For improvements in the *Machinery for Sawing, Jointing, and Smoothing Staves;* Daniel Toms, Auburn, Cayuga county, New York, July 8.

A sawing and jointing apparatus constitute the principal parts of this machinery. The saws are so fixed as to form segments of circles of different radii, according to the size of the vessel intended to be formed. The frame in which these saws are fixed is of cast iron, and is in the form of Hadley's quadrant, or octant. The saws used are mill, or cross-cut saws, placed within this frame, and secured there by screws, nuts and stirrups; the curvature given to each saw is such as to make it the segment of a circle whose centre is the angular point formed by the meeting of the sides of the frame. The frame is made to vibrate by a crank and pitman from a flutter wheel, or in any other convenient way.

The jointing is effected by two circular saws, each running upon its own axis, their distance from each other being adjusted according to the width of the stave. Their planes form an angle with each other which is to be varied according to the width of the stave, and the diameter of the vessel to be formed. The machinery is sufficiently well described and delineated, but there is no claim to any part of it, and the whole can scarcely be considered as new.

---

10. For improvements in the *Grist Mill;* Charles Langford, Claridon, Geauga county, Ohio, July 8.

This is another member of a family which has of late become very prolific, that of the small grist mills.

"The improvement claimed consists in the machinery following, by which the revolving stone is raised and depressed, and kept confined whilst revolving, at any desired elevation." That is, there is a screw and nuts for the purpose of holding the bridge tree wherever it may be placed.

---

11. For a *Thrashing Machine;* James H. Arnold and Jesse Bonsall, Belmont county, Ohio, July 8.

The patentees after describing the structure of their machine, (in doing which they might have copied many of the specifications already in the office,) say, "in this improvement is claimed the prin-

ciple of giving elasticity to the thrashers by means of springs, and the principle of feeding said machine by a diagonal, or inclined feed table or shoot; the application of the above principles either connectively or separately to the purpose of thrashing small grain, or seed of any kind, is what we claim as our improvement."

---

12. For an improvement in Judkin's ointment, called *Shepherd's Improved Specific Ointment;* Nathan Shepherd, Belmont county, Ohio, July 9.

After due consideration, we have determined to obtain absolution from a promise we formerly made not to publish recipes; in several instances we have felt that we were violating a duty to the public in not making known that of which it is their interest and their right to be informed; we ought, in fact, in the first instance, to have exempted empirical medicine from the operation of the rule, and this, hereafter, will be the case. In determining when to publish and when to withhold, we shall endeavour to take sound discretion for our guide; in making such publications, we violate no right, as the law makes every patent public; and the courts would vacate such as might be proved to be injurious.

The following is the recipe.

"Take half a gallon of flaxseed oil, boil it in a new earthen pot till it be sufficiently heated to turn a feather brown, then add one pound of red lead, stir them together for five and twenty minutes; to this add two ounces of spirits of turpentine, and half an ounce of olive oil; stir it again from 10 to 15 minutes, when it may be set off to cool, and will be fit for use."

"*Mode of application.*—Spread the ointment on common writing paper, and bind it to the part affected, and renew the plaster every twenty-four hours."

The resemblance between this and the common Diachylon plaster will be seen by every one acquainted with pharmaceutical preparations—they are in fact essentially the same.

---

13. For a machine for *Breaking Stone and Thrashing Grain;* William H. Bell, Fortress Monroe, Virginia, and T. P. Andrews, Washington City, District of Columbia, both of the army of the United States, July 9.

A wooden frame is made to run upon truck wheels, which wheels are to be taken off when the machine is used. An upright shaft and horizontal lever, enable a horse to turn a large crown wheel in the usual manner: this crown wheel is geared into a trundle or cog wheel which gives motion to a horizontal shaft carrying wipers, or lifters, and these raise two hammers fixed much in the manner of trip hammers. The stone to be broken is put into cast iron boxes, the bottoms of which are formed of bars placed at such distances apart that the broken stone will pass between them; each hammer is to weigh 300 lbs., and it is proposed to form their faces in furrows

to correspond with the spaces between the bars, or, should this not be found to answer well, to make them rounding.

The machine is merely described, without particularizing what parts are claimed as new.

---

14. For a mode of *Preparing Oil and Spirits of Turpentine for Paint;* John J. Pendergart, Palmyra, Wayne county, New York, July 9.

This is one of those processes in the arts, which, without permission from the patentee, we shall not, at present, publish.

---

15. For a machine for *Dressing Hemp and Flax;* Abel Smith and James Olney, Westmoreland, Oneida county, New York, July 10.

This machine, like most for the same purpose, acts upon the hemp or flax altogether by fluted rollers. One roller of 20 inches in diameter is to be surrounded by 5 or 6 others of about 10 or 12 inches in diameter. The flutes to increase successively in fineness. There is nothing peculiar in the machine, nor is there any claim made. The drawing also is without written references.

---

16. For an improved *Concave Sectional Elastic Bed,* to be applied to a machine *for Thrashing Grain;* David Flagg, jr. City of New York, July 10.

The improvement claimed is here distinctly set forth, as it is confined to a particular part of the machine, which, in other respects, resembles those previously used.

The concave bed, in which the revolving beaters work, is made of pieces of plank of about two inches in thickness, placed flatwise together, and curved so as to suit the beating cylinder. The number of these pieces depends upon the length of the cylinder. They are loosely connected together by a bar of iron which passes through them, considerable play being allowed in the boring of the holes. The ends of this bar rests upon spring boxes, and each thickness of plank is separately borne up towards the beaters by spiral springs under them. Between each plank is a washer, keeping them about a quarter of an inch apart, so that they may play freely, and independently of each other.

The claim is to "the method of forming a *concave sectional elastic* bed, of from six to twelve pieces of plank, (more or less) as above specified, and each one, two, or more pieces or sectional parts of the bed, being capable of being moved to or from the beater, separately or together, as occasion may require."

---

17. For a *Machine for making Shot, and Musket and Rifle Bullets;* Julius Willard, Baltimore, Maryland, July 10.

The machinery referred to in the above title is intended to manu-

facture balls by first casting, and afterwards condensing them by rolling. Several abortive attempts have been made to manufacture bullets by pressure, so as to condense, and equalize them; the failure has not resulted from any real difficulty in accomplishing the object, but from the increase in cost. The present plan exhibits a good arrangement for the purpose, and is very distinctly described. The specification refers throughout to the drawings which accompany it, and without which no more than a general idea of the machinery can be given.

The balls are first cast in moulds consisting of two iron plates, faced so as to fit closely together. The lower plate forming one-half of the bullet, and the upper plate the other half. The thickness of the upper plate is just equal to that of the half bullet, there being a hole through it above each, for the purpose of casting.

These plates are so placed as to form an inclined plane, upon a frame made for the purpose. A hopper to contain lead to fill the moulds, is made to slide over, and in contact with the upper plate, and is followed by a knife which removes all the superfluous metal. The hopper is borne down by a weighted lever, and moved by a rack and pinion.

Upon being turned out of the moulds, the bullets are coated with black lead, to prevent their adhering, after which they are passed through the rolling machine. This consists of small hoppers, into which they are first put, and by which they are delivered on to grooved rollers, properly adapted to them; of these there are five, which they pass in succession, each with the grooves a little smaller than the preceding one; this number, it is said, is found sufficient to render the balls perfect.

The claim is to the general arrangement of the whole of the machinery.

---

18. For a *Water Elevator, for Elevating Water from Wells and Fountains;* Enoch Honeywell, Broadalbin, Montgomery county, New York, July 10.

Eight closely written pages of foolscap are occupied by the description of this machinery, which consists of the common horizontal wind mill, employed to cause an endless strap to revolve over pullies; one in the well, and the other at the point at which the water is to be discharged; buckets, or canisters, being attached to the strap, for raising the water. After the long and minute description of every part, there is no claim to any, and had we drawn the specification, this omission would have relieved us from one great difficulty, that of telling what there was new in the application.

---

19. For an improvement in *Bedsteads for the Sick;* Avery Smith, Milo, Yates county, New York, July 12.

A part of the frame of this bedstead, with the sacking bottom attached to it, is made to raise, it being provided with a hinged

frame for that purpose. The raising is to be effected by a rope passing over a pulley attached to the middle of the head rail of the tester.

In this contrivance there is no novelty; bedsteads made to raise in this way, and otherwise adapted to the purposes of invalids, are well known to physicians and surgeons.

---

20. For an improvement in *Manufacturing Cloth Composed of Flax and Wire;* Peter Laporte, Augusta county, Virginia, July 12.

This wire cloth we are told will be suitable for roofing of houses, for portmanteaus, valises, knapsacks, cartridge boxes, light boats, hammocks, bottoms of chairs, cradles, carriages for children, coverings of decks of steam boats, military caps and armour, carpeting, sacking bottoms for bedsteads, sofas and settees, pannels and roofing for carriages, baskets, water buckets, travelling trunks, carrying the mail, &c. &c. &c.

There are two things which surprise us in regard to this patent; the first is, that it should have been taken out at all, and the other that a second patent for the same thing should be obtained by the same gentleman.

By turning to page 213 of our second volume, new series, it will be seen that on the 28th of July, 1828, a patent issued to Mr. Laporte, for a cloth for the boots of stages, carpeting, sacking bottoms, &c. &c. to be composed of hemp and wire. Not the slightest allusion is made in the present instrument to the former. In both specifications it is stated that the cloth may be well covered with paint on both sides; and a specimen so painted was deposited in the patent office at the time the first patent was issued.

Had it been the design of the patentee to produce an article as unsuitable as possible for the various purposes to which he proposes to apply it, we should have deemed him eminently successful. The cloth is without elasticity; the chain and filling are as incompatible as they could well be, one being well adapted to cut the other; the wire is easily indented, takes a set, and will break by the ordinary bending backward and forward to which it is liable. There is now at the post office in this city, a specimen of a mail bag of this manufacture, which in being merely brought to the office, without the rough treatment which such bags are to meet with in actual use, exhibits strong marks of its inability to enter the service.

---

21. For a "*Double Spinner,*" adapted to the common spinning frame, or throstle; Ethan Bowen, Providence, Rhode Island, July 13.

This patent is taken for an improvement on the spindle and its appendages. The yarn is to be distributed upon the bobbin by means of a ring, but not without flyers, as in Thorp's and some others. In this instrument the ring is placed on the arms of the flyer, and has notches on its opposite sides corresponding with those arms; by

which means it is caused to turn with the flyers, and is kept in its place. The top of the flyer terminates in a tube which runs in a thread rail; and the thread is distributed upon the bobbin by notched pieces of wood, or metal, which embrace the outer edge of the ring, and raise and depress it in the manner of a waive rail.

The spindle and flyer are both banded, either from the same or separate drums, so that their motions are distinct from each other, and may be varied; the flyer, for example, may be made to move faster than the spindle, to wind the yarn on the bobbin, or the spindle may be made to move faster than the flyer, for the same purpose; the difference between the motions of the flyer and spindle being sufficient to wind the yarn on the bobbin when small; but it may be increased to increase the friction of the bobbin, as the strength of the yarn may require.

The spindle may be similar to the common throstle spindle, having a step and bearing rail on which it turns.

Several modifications of the spindle, as well as of other parts, are represented; and it is observed also that the ring may be dispensed with entirely, and the yarn be distributed on the bobbin by means of a hook attached to one arm of the flyer, the spindle being made to vibrate.

The claim is to "the method of making or regulating the friction of the bobbin or spindle on which the yarn is wound. And also the method of annexing a ring to the flyer for the purpose of distributing the yarn on the bobbin or spindle. The advantages arising from them being the production of a light draft on the yarn, so that fine yarn can be made with greater facility on the common spinning frame than the common mode of using the bobbin will admit."

---

22. For a *Machine for Thrashing Wheat*, and other kinds of small grain; John Stowits, Gorham, Ontario county, New York, July 13.

Thrashing machines we usually dismiss with a brief notice, but in the present instance the ordinary arrangement is *inverted*, and as this constitutes a difference much greater than usual, we therefore publish the description entire. (See specification.)

---

23. For an improvement in the *Rail-way;* Edward Dunscombe, City of New York, July 13.

(See specification.)

---

24. For an improved *Churn;* Moses Granger, Syracuse, Onondaga county, New York, July 14.

In this churn there are two vertical shafts, each carrying dashers, and both turned by means of a crank and cog-wheel above, in a way which we have more than once described. No claim is made to this part, the improvement consisting of a partition, crossing the middle

of the churn, to prevent the cream from acquiring a rotary motion. This partition is notched to allow the dashers, or wings, to pass.

---

25. For a *Machine for Cross Cutting, Sawing up, and Slitting Wood;* Aaron H. Foot, Amboy, Oswego county, New York, July 14.

The description of this machine is about as defective as it is possible for such an instrument to be; the drawing, however, is very well executed, and, with the references to it, serves to give a sufficiently clear idea of the construction and operation of the machinery. A square frame is made, and this is to stand upon the log which is to be cross cut, it being furnished with hooks, to fasten it on, in the manner of the dogs of a saw mill carriage. Two upright posts are mortised one in each side of the frame, and between them the circular saw, and the wheels and pinions by which it is to be moved, are situated. A separate frame slides up and down between these uprights, like a saw frame between its fender posts. The gudgeons of the circular saw, those of the toothed wheels and pinions to which it is geared, and of the crank by which they are turned, all work in this sliding frame; the circular saw being at the lower end, and running vertically.

When the frame is fixed upon the log, the saw touches it, and when put in motion by means of the crank, cuts into it, descending by the weight of the sliding frame, and the contained wheels, until it has cut through, when the sliding frame, with its machinery, is raised up by racks and pinions.

This certainly is a very complex, and, we think, a very unpromising machine; but as among the other omissions of the specification, the patentee has neglected to make any claim, we think it unnecessary to animadvert upon its merits.

---

26. For a *Rotary Pump*, to be used for the raising or forcing water and other liquids; Ebenezer R. Hale, Hyde Park, Dutchess county, New York, July 14.

(See specification.)

---

27. For a machine for *Stamping Brass, Copper, Tin, Iron, and other Malleable Metal;* Jacob Stroop, Landisburg, Perry county, Pennsylvania, July 17.

What difference there is between this and the ordinary stamping machine used in the manufactories for cabinet furniture, and for many other purposes, the patentee has not told us. These stamping machines are usually constructed upon the principle of the pile driving machine, and such is the case in the present instance. In these instruments a rope has usually been employed to raise the weight, but for this the patentee has substituted a rack and pinion.

When we learn what are the claims of the patentee, we will com-

municate this information to our readers; at present we are without data.

---

28. For an improvement in the *Rolling Mill, for Middling and Edging Spring Steel for Carriage Springs;* George Stoudinger, Newark, New Jersey, July 17.

The rollers of this mill are so formed as to edge the steel and to shape the middle in the way required for carriage springs. In the principle of the machinery there is not the slightest novelty. We do not know that *carriage springs* have been prepared in this way; but an almost infinite variety of other articles have been so formed. The only claim, therefore, that could be made in the present instance, would be to the particular application of it to springs; a claim of doubtful validity, and not made by the patentee.

---

29. For the *Application of Steam in the Art of Making Soap;* Bernard Zell and James Doyle, Baltimore, Maryland, July 19.

There is no novelty whatever in the apparatus described in this specification, nor do the patentees make any pretension of the kind. Tubes from a boiler conduct the steam into tubs, or vats, containing the ordinary materials for making soap. Another tub is added which contains tallow, and which is to be kept in a melted state by the steam, for the purpose of making candles: this, however, is not alluded to in the claim, which is to "the application of steam to making soap, and the vessels and machinery herein described and specified for that purpose."

The latter part of the foregoing claim is fraught with danger, for the reason already given; and the former part does not, we apprehend, stand upon the most secure basis. In the manufacture of sugar, and of various other articles, vaporization has been effected by the application of steam; and although many patents have issued for the boiling of sugar in this way, they have all been for the structure of the apparatus employed, no one among the patentees having broadly claimed the application of steam, which is now as familiar as the application of heat by a naked fire.

---

30. For a *Machine for Thrashing Grain;* Amos Lupton and John Lupton, of Frederick county, and Jacob Janney, of Loudon county, Virginia, July 28.

"The improvements as here claimed are the cylinder of beaters as before described, and the cast iron fluted ribs as placed in front of these beaters." As the construction of the individual parts, and the arrangement of the whole machine are such as to give it the appearance of being a twin brother to some which we have previously seen and described, all further notice would be superfluous.

LIST OF PATENTS FOR AUGUST.

1. For an improvement in the mode of *Making Paper* for writing, printing, wrapping, and boards, *from wood;* Lewis Wooster and Joseph E. Holmes, Meadville, Crawford county, Pennsylvania, August 3.

(See specification.)

---

2. For an improvement in the *Mode of Making and Manufacturing of Crackers, Ship, Pilot, or Navy Bread, or Biscuit,* by means of which one or more may be cut, pressed, dotted, stamped, and finished, by and at the same operation; being a rectangular machine, and called the "Franklin Cracker Machine;" Nathan Daskam and David G. Wood, Geneva, Ontario county, New York, August 5.

We are informed in the specification that "this improvement in the making and manufacturing of crackers saves manual labour, and enables two persons to make as many in one day as ten men can in the same length of time by the common operation, and the crackers are of a superior quality, and uniform as to appearance."

The specification consists entirely of references to the drawings which accompany it. There is no claim made; the whole machine, therefore, must be new, or the patent will not stand the test in a court of law.

The dough is placed upon a table which is carried backward and forward between rollers; on the bottom part of the frame there are dockers, which dock, cut, and stamp the cracker.

Without a plate of the machinery the operation of it could not be clearly described.

---

3. For an improvement in the *Manufacturing of Paper* by means of a machine called a "Pulp Dresser;" Elihu H. Thomas and Nathan Woodcock, Brattleborough, Windham county, Vermont, August 11.

(See specification.)

---

4. For an improvement in the art of *Cutting and Casting Music Type;* George B. Lothian, City of New York, August 11.

(See specification.)

---

5. For an improvement in the *Manufacture of Margaric, Stearic, and Oleic Acids,* by the use of caustic lime in the decomposition of the margarate, stearate, and oleate of potash; Henry Seybert and Lardner Vanuxem, Philadelphia, Pennsylvania, August 16.

The specification of this patent will be hereafter given.

6. For an improvement in the *Machine for Making Ropes, Cordage, and Twine;* Samuel F. Dexter and Samuel Graves, Auburn, Cayuga county, New York, August 24.

Several machines have been invented for doubling and twisting cordage, without the necessity of employing long rope walks; for the smaller kinds of cordage some of these machines have answered a good purpose, but we are not aware that the attempts to apply them in the manufacture of large ropes have been successful. From the complex nature of such machines their structure cannot be shown without drawings; and their relative worth can be told only by their practical application. The arrangement of the parts of the present machine differs from those with which we have previously been acquainted; it is minutely described, and its supposed advantages dwelt upon at large; there, however, is no claim, either general or particular.

---

7. For an improvement in the *Machine for Clearing and Deepening Rivers*, called the "Floating Excavator;" William Morrison and George Tomb, Jersey Shore, Lycoming county, Pennsylvania, August 25.

Two boats are to be made, somewhat in the form of scows. They are each to be about 60 feet in length, and connected together by timbers passing from gunwale to gunwale. The scoop by which the excavating is to be effected, works between the boats. One of the vessels must be of sufficient width to allow of a circular walk for a horse; the other need not be more than half that width. A capstan is placed in the centre of the larger boat, and from this a lever, or sweep, projects, to which a horse is to be attached to turn the capstan. The rope, or chain, which winds round the barrel of this capstan, is attached either to a harrow, or to a scraper, as the case may be. When the earth or gravel requires to be loosened, the harrow is employed, and afterwards the scraper, to remove it. The handles of these instruments are to slide upon the timbers which connect the two boats, and are to be guided by four men. The harrow and scraper, it is said, will work in water from one to six feet in depth, and one horse, with five men, will excavate from 60 to 70 cubic yards per day. The boats lie across the stream, and are to be securely moored.

We have in the specification no information of the mode in which the dirt is to be removed from the scraper; and on some other points of equal importance it is altogether silent; nor are we informed in what part of the machinery the novelty consists, as the whole is merely described, without any thing in the nature of a claim being preferred.

PATENT FOR SEPTEMBER.

For a *Machine for Cutting Biscuit, Crackers, Cakes, Pilot and Navy Bread;* Joseph Clark and Henry Henderson, Baltimore, Maryland, September 13.

The dough to be made into biscuits is put into a hopper, whence it is delivered between two rollers; these roll it to the proper thickness, and spread it upon a sliding board; this board is made to advance with the proper degree of speed. From a whirl, attached to one of the rollers, a band extends to the opposite end of the bench or frame, in which the sliding board works, and is made to turn a crank shaft; a pitman, or connecting rod, passes up from the crank, to one end of a lever, working like a scale beam. At the opposite end of this lever is a rod, which is worked up and down by the vibrations of the lever; and on the lower end of the rod is screwed the cutter and prickers, cast in one piece, and of the size and form desired.

The sliding board is made to advance by means of notches along its side in the manner of a rack, into which a catch, or feed arm works, this feed arm being operated upon by the same crank, which causes the lever to vibrate. The advance at each thrust of the feed arm, is equal to the diameter of the biscuit to be cut.

The claim is to the "machine for cutting biscuit, crackers, pilot and navy bread, &c. as before described, except the rollers and hopper, and the form of the cutters; but we claim the mode of casting the cutters, prickers, and plate of metal, in one piece."

We think this claim both indefinite and insecure; indefinite in claiming the machine "as before described;" and insecure in afterwards apparently limiting it to the cutter, &c. "in one piece," as the cutters, &c. may very readily be made in several pieces, and securely joined together. The casting in one piece may be the cheapest mode, we much doubt its being the best.

Note.—It will be seen that only seven patents were issued in the month of August; and in September, but one. This was in consequence of the absence of the President from the seat of government, his signature being necessary to the validity of a patent.

SPECIFICATIONS OF AMERICAN PATENTS.

Specification of a patent for an improvement in the ordinary machine for Thrashing Wheat, and other small grain. Granted to JOHN STOWITS, *Gorham, Ontario county, New York, July* 13, 1830.

THE improvement consists in a variation from the thrashing machines now used, in this respect; those now in use are fed near the bottom of the machine, and are so constructed that the main cylinder catches the straw at the *lowest point* in its revolution, and, of course, throws the straw, grain and chaff upwards; they then fall together in a confused mass; this renders it very troublesome to the person employed in separating the refuse from the grain, and while the machine is in motion the place he must occupy is filled with dust; the velocity of these machines is such, and their power so great, that grain, and even stones, sticks and weeds, will greatly annoy, and sometimes injure, the person so employed.

By this improvement all these objections are avoided; a concave piece of wood, filled with teeth of proper size, is placed at the *top* of the machine, and the cylinder also filled with teeth plays into this, and the straw to be thrashed is put on an apron leading to the top of the cylinder—the course of the straw is therefore downward, and it falls on a sieve. A blower in the lower part of the machine, fixed as in the ordinary fanning mills, separates the refuse from the grain. The straws of ordinary length, by the force which they acquire in the revolution, are thrown beyond the main body of the grain.

JOHN STOWITS.

Specification of a patent for an improvement in the Rail-way, intended to be applied to the loading and discharging of vessels, of coal, and merchandise of all descriptions, and the transportation of goods from place to place. Granted to EDWARD DUNSCOMB, *of the City of New York, July* 13, 1830.

THIS new and valuable improvement consists in elevating the rail-way in such manner that coal may be swung underneath it (by means of a chain attached to the bottom of the rail carriage) and may be thus transported with facility to the place of deposit.

The rail-way is sustained in a level and horizontal position, and at the required height, by a suitable number of upright posts, and is permanently secured by bolts or other suitable fixture, to them. The lower extremities of these posts are securely imbedded in the ground, and are preserved in their respective positions by means of suitable braces or stancheons.

On the surfaces of the horizontal bars which constitute the bed pieces of the rail-way, are beds of wrought or cast iron, or other proper material, which are firmly secured to them, and extend their whole length. These beds are made perfectly smooth and level, to receive the wheels of the carriage, which may be flanched or grooved to move upon them.

The rail carriage consists of a frame constructed of suitable material, to which axles of wrought iron are attached by means of bolts or other contrivance. The wheels may be formed of wrought, or cast iron, or other proper substances, and may be made solid or otherwise, with their surfaces either flanched or grooved to move on the beds of the rail-way, as before mentioned. There is attached to the bottom of the rail carriage, and suspended from it, a chain which may be lengthened or shortened at pleasure, having a hook at its termination or extremity for attaching a coal tub.

At one extremity of the rail-way, and projecting above it, a crane is placed, and secured by suitable fixtures. This crane is supplied with a chain or rope fall, which is used for raising the coal to the carriages, from the vessel, or other place of deposit, and may be worked by horse or other power.

There is constructed, beneath the rail-way, and directly under

the crane, a staying which is made to slide between the foot, and may be raised or depressed at pleasure by means of pins or bolts, which are adapted to apertures bored in the posts.

The coal is raised to the staging, before mentioned, in tubs, by means of the chain fall, attached to the crane, where it is disengaged by an assistant, and transferred to the carriage, the chain and hook of which hang directly over the staging.

The carriage is set in motion by means of ropes and pullies, or other machinery, and the coal, suspended in tubs beneath, is transported to the distance, or place required, where it is deposited; the carriage immediately returning with the empty tub.

The subscriber claims the privilege of constructing his improved rail-way of a double form, so as to admit of two carriages moving parallel to each other; in which case the middle or centre horizontal bar, or bed piece, has, on its surface, beds for the inner wheels of both carriages, on which they move, as before mentioned. The crane in this case is placed in the centre, and is enabled to serve each carriage in succession by swinging two ways.

He also claims the sole privilege of applying his improved rail-way to the loading and discharging vessels of coal, and merchandise of all descriptions, and transportation of goods from place to place.

E. DUNSCOMB.

Specification of a patent for a Rotary Pump, to be used for the raising or forcing of water and other liquids. Granted to EBENEZER R. HALE *and* CHARLES LAZAREME BELL, *of Hyde Park, Dutchess county, New York, July* 14, 1830.

Two wheels are constructed, one of them having, on its periphery, floats or wings, three in number, (more or less) at equal distances apart, and something in the form of cogs; the other said wheel having a cavity, or cavities, (depending upon its size) in its periphery, into which cavity or cavities may fall the wings or floats of the wheel afore mentioned, they being placed in a manner to revolve together, and when so placed, their peripheries are intended to come in close contact, so as to form a water joint.

The above described floats are an inch and a half in length, and three in breadth, (more or less,) or the thickness of the wheel, or hub, on which they are; which thickness, as well as the length of the floats, should be in proportion to the diameter of the wheel on which they are, and the quantity of water, &c. they are intended to raise or force.

The two above described wheels are enclosed in a casing corresponding with the size of the wheels, which casing fits closely upon the sides of the wheels, and upon the periphery of the one having the cavity or cavities as aforesaid, and equally close on the outer extremity of each wing, or float, in each and every part forming water joints; to effect which it may be packed with leather, or other suitable

material, in such places as may be found necessary. Through the ends, or heads, of the above described casing, pass the shafts which support the two wheels before specified, on, and with which they are made to revolve.

The gudgeon boxes are made in such a manner as to admit of packing, which packing generally consists of cork. Upon the shafts just mentioned, and on the ends which project through the end, or head of the casing, are toothed wheels; they are of such size as will cause the wheels within the casing to revolve in such a manner as to bring the floats of the one into the cavity, or cavities, of the other, which said fronts are fitted, or packed, so as to form a water joint while revolving and within the cavity or cavities of the wheel afore mentioned. To the casing which contains the wheels, and on or near to the periphery of the same, are two passages or apertures, to each of which a pipe may be attached, one for the supply, and the other for the discharge of water, &c.; the passages to which are the pipes, enter the casing as near as is convenient to the wheel within, having in it the cavity or cavities aforesaid, one of them being upon each side of the same; or the place for the discharge may be varied, provided it be placed from the supply passage a distance not less than the space between two floats or wings. The pump may be put in motion by hand or other power; the water, &c. is drawn in by suction, produced by the motion of the floats as they recede from the wheel in which is the cavity or cavities: it is discharged in like manner by their motion as they approach the discharge passage. This pump is subject to variations: it may have two places for supply, and two for the discharge: this may be done by placing another wheel having in it a cavity or cavities similar to the one above specified, on the opposite side of the wheel, upon which are the floats, and gearing it with that wheel in such a manner as to give to it the necessary motion for bringing the wings, or floats, of the one, into the cavity or cavities of the other. The above specified floats, or wings, may be attached to the wheel by forming a notch, or mortise, in the wheel from the periphery, in a line to the centre, of the same thickness of the float, and one inch in length (more or less:) in this notch, or mortise, is placed one end of the float, leaving the other end projecting a suitable distance from the periphery of the wheel. A *screw and nut*, or a *wedge*, or *spring*, is also fixed in the bottom of the said mortise, or notch, for throwing the wings, or floats, out from the wheel, as occasion may require, for the purpose of keeping a close joint between them and the casing.

That which I claim as my invention and improvement, is, having the floats which project from the periphery of the wheel, and which act as buckets, *stationary*. And also the application of the revolving block, or wheel, in which is the cavity or cavities to the rotary pump; the placing and revolving these wheels together, as above specified, for the above mentioned purposes.

EBENEZER R. HALE.
CHARLES LAZAREME BELL.

Section of Hale and Bell's Rotary Engine for Pumping, &c.

A, the wheel having upon its periphery, floats, or wings.

B, small wheel, having in it a cavity or cavities to receive the floats.

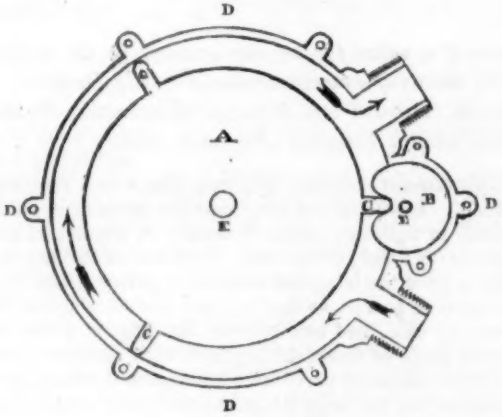
C, C, C, the floats, wings, or fans.

D, D, D, the casing which encloses the wheels.

E, E, the shafts or axles.

The passages for the supply and discharge of water, are shown by the bent arrows.

The axes of A and B are connected together by toothed wheels on the outside of the box, or case, to insure the passing of the floats into the cavity in C.



Specification of a patent for an improvement in the mode of making Paper for Writing, Printing, Wrapping, and Boards, from Wood. Granted to LEWIS WOOSTER *and* JOSEPH E. HOLMES, *Meadville, Crawford county, Pennsylvania, August* 3, 1830.

BE it known that we, the said Lewis Wooster and Joseph E. Holmes, have invented, constructed, made and applied to use, a new and useful improvement in making or manufacturing paper for writing, printing, wrapping, and boards, from wood; the preparation of which, for making the paper in the common paper mill, is as follows, viz. The wood is reduced to shavings of the ordinary jack-plane shaving size, or bruised so as to be rendered of nearly the same size of the shaving; they are then placed in a cistern, or boiler, of sufficient dimensions, and covered with water, which is put to a boiling heat. To every one hundred pounds of the wood (thus reduced) put from twelve to eighteen pounds of alkali, either vegetable or mineral, in proportion to its quality for strength. If salts are used,

they should be reduced before they are placed on the wood in the cistern, or boiler, with the water; they may, however, be put in with the water and wood before reduction, but the first mode is found the most preferable. Should lime be used, there must be a sufficient quantity in all cases to equal twelve pounds of pure black salts. For every one hundred pounds of wood, which may be leached before being placed in the cistern with the wood and water, or thrown in, in its pure state. One hundred pounds of wood, will, if well attended to, make from five to seven reams of paper.

LEWIS WOOSTER.
JOSEPH E. HOLMES.

Specification of a patent for an improvement in the manufacture of Paper, by means of a machine called a "Pulp Dresser." Granted to ELIHU H. THOMAS *and* NATHAN WOODCOCK, *Brattleborough, Windham county, Vermont, August* 11, 1830.

THIS improvement consists of a box about two feet square and one foot deep. Inside of the box, near the bottom, is placed a *hog*, or *float wheel*, or agitator, about 7 inches in diameter, and as long as will play freely inside of the box. One end of the hog shaft passes through one side of the box, and receives a pulley which is connected with some moving power, so that a rapid motion is given to the hog. Directly on one side, and nearly over the hog, is placed a sieve or screen, on an angle of about 45 degrees, with apertures so fine that knots and other offensive particles cannot pass through; but with the agitation caused by the hog, the pulp is allowed to pass freely when diluted with water.

A partition of board is placed on the opposite side of the hog, much like the screen; the tops of the screen and partition are united together when in use, in such a manner as the pulp shall not get through between them. The partition reaches within about two inches of the bottom of the box; the pulp flows in at one end of the box, and passes under the partition, is then washed through the sieve or screen, and flows out at the opposite end of the box through an aperture.

The sieve, or screen, is made of triangular bars of metal, about one-fourth of an inch in width on each angle; these bars are made straight and true, and placed near enough to each other to prevent coarse particles passing through the apertures.

These bars may be made circular, and placed perpendicularly or horizontally, with a revolving or vibrating hog, which we conceive to be our principle.

We do not claim as our invention, the hog, or agitator, for mixing and giving motion to pulp in the manufacture of paper, nor of the common engine for grinding rags into pulp. But we claim the discovery of applying the hog and common engine to the purpose of

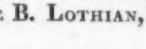
forcing the pulp through the apertures of a screen or sieve, for the purpose of separating knots and filth from the pulp.

ELIHU H. THOMAS.
NATHAN WOODCOCK.

Specification of a patent for an improvement in the art of Cutting and Casting Music Type. Granted to GEORGE B. LOTHIAN, *City of New York, August* 11, 1830.

THE staff lines are fitted on single bodies, and dress up to the face on the extreme edge of the body, leaving no shoulder.

What I claim as new, and my own invention and discovery in the above described type, and for the use of which I ask an exclusive privilege, is:

In cutting and casting but one staff line on the time marks, thus; they are, therefore, as  readily made to line as a plain staff line. The type thus cast projects nearly one-half over the body, and fits on to the plain staff lines, above and below.

In cutting and casting the angular quavers without any projection over the body, and a line, thus —, or an angle thus, ⌐ or thus ¬, is cast on a body equal to an entire quadrate, or half the size of the body of the staff lines, which is placed in the composing stick first, and then the quaver on it, which causes the quaver to run on the next line below, thus.

An *en* quadrate or character on the half body is placed next in the composing stick, and makes up the two lines.

The notes in the lines are made in the common manner; as also seconds, thirds, and choosing notes, and make perfect joinings in the stems of the notes, without kerning, or projecting over the body. The slurs are cut and cast in the spaces of the staff, and come on the body without projecting.

This improvement reduces the number of sorts in a fount, and facilitates the manufacture. GEORGE B. LOTHIAN.

Observations on the Paddle Wheels invented by Mr. PERKINS, *and those patented by* Mr. BENJAMIN M. SMITH, *of Rochester, New York, November 20th,* 1829. *In a letter from* Mr. J. DOOLITTLE, *of Bennington, Vermont. To which are subjoined some remarks by the* EDITOR, *and the specification of* Mr. SMITH's *patent.*

To W. Hamilton, Esq. Actuary of the Franklin Institute, Philadelphia.

Bennington, Vermont, August 4th, 1830.

MY DEAR SIR,—You know how much I admire the general spirit of frankness, candour, and judiciousness, which characterizes Dr. Jones' remarks on the multitude of pretended inventions which throng

the patent office. And I should be exceedingly loth to ascribe to him any thing like a bias in favour of the inventions of particular individuals, without regard to the merits of the inventions themselves.

I am led to these remarks by the following circumstances.

Some three or four days after I received the June number (No. 6, vol. v.) of the Journal of the Franklin Institute, I left Bennington on an excursion to the west. On Saturday evening, 10th July, being at Syracuse, I saw a steam boat arrive, on the canal, from the west. Some gentlemen present, who had already seen that boat, observed that her machinery was of an unusual construction. I immediately went to the quay, and in the few minutes the boat remained, got into conversation with the person whom I was led to believe was the inventor; he invited me on board to examine the machinery. I had only time to see the wheels, and you may judge of my surprise when I found that, in the inclination of the buckets, and in the angle which the axes of the wheels formed with the plane of the keel, they were exact *fac similes*, or rather, perhaps, exact prototypes (for they were probably made first) of the wheels invented by Mr. Jacob Perkins, and described in the above number of the Journal. The gentleman above alluded to informed me that the specification for these wheels had been sent to Washington in November, 1828, and a patent obtained in November, 1829.

On my return home, I sought in vain among the notices of patents, for some indications which should, at least, lead to the discovery of the name of the author or inventor, and it was not until yesterday, that I learned, by a letter from a friend at Syracuse, that it is Mr. Benjamin M. Smith, of Rochester, Monroe county, New York. On recurring to the Journal, with these data before me, I find at page 136, vol. v. that Mr. Benjamin M. Smith did obtain a patent on the 20th of November, 1829, (ten days prior to the date of Mr. Perkins' patent.) There is nothing, however, in the editor's notice of Smith's patent which can induce the belief that he thinks the invention entitled to the least consideration, or respect; on the contrary, he says, "wheels of the above kind have been patented, tried, and abandoned, long since," while, in speaking of an exactly similar contrivance by Mr. Perkins, he says, page 385, same volume, "should the advantage produced by the present paddle wheel be, in its amount, but one-half equal to the ingenuity manifested in its construction, we think it will be the best, by far, which has yet been proposed."

I have not the honour of a personal acquaintance with Mr. Perkins, though I have long known him by reputation, and feel a high respect for his mechanical talents. Of Mr. Smith I have never heard until now; but, it seems to me that, if an invention is to be judged of by the intrinsic merits, either of its ingenuity or its usefulness, the same thing which in one case could call forth such unqualified encomiums, ought, in another, to command, at least, a small share of courtesy, even though its production should not be accompanied by a name already resplendent with distinguished honours.

As I am unwilling to suspect Dr. Jones of either intentional injustice or undue partiality, I must suppose that either the drawings

or the specification, or perhaps both, were so defective that he could not derive from them a correct understanding of Mr. Smith's invention. But, however this may be, I beg leave to repeat that the two inventions, (though no doubt both *original*) are exactly similar in every respect. The boat I saw is called the "Novelty," and her wheels are fixed in the stern.

I beg you will attribute this intrusion to its true motive—my love of truth and justice.

I am, sir, very respectfully, your obedient servant,

J. DOOLITTLE.

Remarks by the Editor.—Although the above letter is dated in August last, it has but just come into the hands of the Editor, or it would have received an earlier notice. We have not the temperament which will admit of our sitting at ease under the grave charge of partiality, from an intelligent correspondent, who is actuated only, as we really believe, by the "love of truth and justice;" we are prompt either to correct our mistakes, or to repel an unworthy insinuation, or a false charge. Whether the animadversions made in this Journal, have been tinctured with partiality, let some of our friends tell, whose inventions have passed under review; and whether such has been the fact in the case before us, will soon appear.

We are far from Syracuse, and far from the boat which Mr. Smith had put into actual operation, but we have the testimony of Mr. Doolittle, and the patents of Mr. Perkins and of Mr. Smith before us, and will place them before our readers, when it will plainly appear that either Mr. Doolittle saw "what is not to be seen" in the angles of the buckets and shafts of Mr. Smith's wheel, or the latter gentleman, finding that his "*smoke jack*" wheel must take its place among those which had "been patented, tried, and abandoned," had determined to essay that, upon the *ingenuity* of which we had passed "unqualified encomiums." We believe the latter to be the case. That our readers may see the grounds of our belief, we now give his specification, and a cut from the drawing which accompanies it.

Specification of a patent for a new and useful mode of Propelling Boats in the Water, by the application of SCULLING WHEELS, *or screw propelling wheels. Granted to* BENJAMIN M. SMITH, *of Rochester, Monroe county, New York, November 20th,* 1829.

BE it known that I, Benjamin M. Smith, have invented a new and useful mode of propelling boats in the water, by the application of sculling wheels, or screw propelling wheels to the boat, and that the following is a full and exact description of the mode in which the boats are propelled, as invented by me.

I make wheels (to the discovery of which I lay no claim, and) which are thus described. Any number of paddles, in shape resembling an open fan (as may be seen by the annexed drawing) and

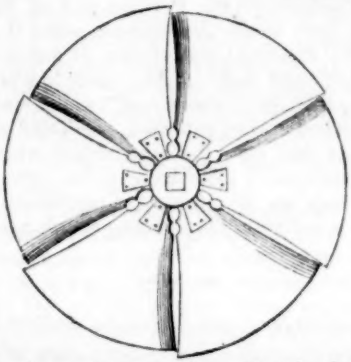
of any length and width, are fastened at the tapered end to a centre block, or hub. These paddles are set oblique from the centre block, at any angle wished, and are set regular, so that the upper extreme points of the paddles would all fall in the circumference of the same circular plane, and all the lower, or opposite extreme points of the paddles would also fall in the circumference of a circular plane parallel to the first named. The distance between these two supposed circular planes would be according to the obliquity and width of the paddles, and the outer ends of the paddles would coincide with the threads of a screw.

The whole wheels are best constructed of iron, but may be of any hard suitable material, and when completed, are like the wheel usually denominated a *smoke jack*. Two of these wheels may be fastened at the stern or bow of the boat, placed perpendicular, or horizontal, with a shaft running from the centre of the wheel, and may be worked by horses, steam, or any other power. The wheels work best when they revolve contrary ways from each other, so as to throw in the water towards each other, and prevent the washing of canal banks.

Any number of wheels may be applied to a boat.

What I claim as new, and as my own invention, is the application of wheels of this description to propelling boats in the manner described; they never before having been used for that purpose.

BENJAMIN M. SMITH.



Is this the wheel, courteous reader, "that in the inclination of the buckets, and in the angle which the axes of the wheels formed with the plane of the keel, are exact *fac similes*, or rather, perhaps, exact PROTOTYPES of the wheels invented by Mr. Jacob Perkins?" Will any one with a grain of mechanical knowledge, and half a grain of candour, pretend that there is any similarity between them? We venture to predict that Mr. Doolittle will not, and that he will confess that Mr. Smith deceived him, in declaring that his patent embraced such wheels. Look at the above cut, a *fac simile* of Mr. Smith's drawing; it is truly, as he denominates it, a "smoke jack" wheel. In Mr. Perkins' wheel there is nothing of the screw prin-

ciple, or any thing which approaches it; the paddle can be set at one angle only, and the shafts at the same angle, or its whole principle is violated. In Mr. Smith's you may set them at "any angle wished," and the shafts at no angle at all, so far as the description informs us.

The wheels, Mr. Smith says, may be placed perpendicular or horizontal; this we do not understand, even as regards the "smoke jack" wheel, but know that it cannot apply to that of Mr. Perkins. The specification of Mr. Smith's patent is certainly not given "in such full, clear, and exact terms, as to distinguish the same from all other things before known, and to enable any person skilled in the art of which it is a branch, to make, and use the same" (Act of 93, Sec. 3,) but it is sufficiently described to show that it is not what Mr. Doolittle supposes. We passed over Mr. Smith's patent with but few remarks, because we thought lightly of it. We did not animadvert upon his claim, because we believed that if it amounted to but little, it still might include all that there was of novelty, or merit, in the contrivance; and we are fully convinced that if he has met with any experimental success, it is because he has changed his plan. We wish Mr. Doolittle to take the foregoing specification, and to find out from it what is intended by "the application of wheels of this description, to propelling boats in the manner described."

In conclusion, we have no doubt, as we have already intimated, that Mr. Doolittle's letter was dictated by honest indignation at the supposed neglect with which one had been treated, who appeared to him to be a man of merit, and we honour his motive. If he thinks that we have given unnecessary strength to some of our observations, we find our apology in his letter, which, by implication, intimates that we had been unjust, or illiberal. If he views the account as squared, so do we, and we leave off as we commenced, good friends.

ENGLISH PATENTS.

To Thomas Bulkeley, *Doctor of Medicine, for a method of making or manufacturing Candles.* Dated January 6, 1830.

This invention is stated to consist, first, in a method of making wax candles by melting the material and pouring it into moulds, instead of by the ordinary method of rolling. The moulds are to be the same as those employed in the manufacture of tallow candles, but as there is a difficulty attending the expulsion of the candles when cold, a circular piece of wood with a cavity in its centre is directed to be placed at the bottom of the mould, when the other end being gently tapped by a mallet, the candle will, by degrees, be driven out. And here we may remark that the patentee appears to have adopted every means in his power to guard against any charge of obscurity in the framing of his specification, having even had the foresight to furnish us with a full sized representation of a *mallet.*

The second improvement is in forming around candles a coating

of wax, or other composition, which requires a higher degree of temperature to melt it than the substance of which the interior is formed; by which means it is affirmed that a cheap candle is obtained, having the appearance of wax or composition, in which the liability to gutter is prevented. The mode in which Dr. Bulkeley proposes to manufacture these candles is by pouring the wax or composition intended to form the coating, when in a fluid state from heat, into common metal moulds; and after allowing it to remain such a time as will admit of the congealing of a portion, the remainder of the wax, which will be that in the centre of the candle, is then poured off, and tallow substituted in its stead. The patentee observes, that an excellent candle may be produced by filling the casing with oil, in lieu of tallow; but in this instance it will not admit of being moved from place to place when in use.

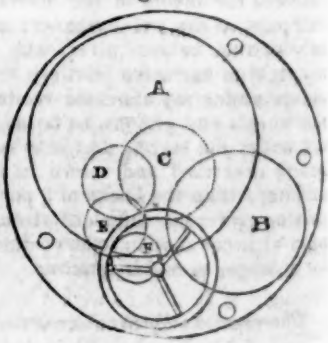
The third claim in this patent is for an improved wick, by which, it is stated, a great saving will be effected in the material usually employed for that purpose. It is formed of a thin cord or thread passed through the centre of the candle, and through a small piece of straw about half an inch in length, around which is attached some common cotton wick of a similar size; the thread will be consumed as the wick burns, and the latter will slide down and prevent the necessity of snuffing. [*Rep. Pat. Inven.*

To ROBERT WESTWOOD, *Watchmaker, for certain improvements in Watches and Timekeepers.* Dated September 23, 1829.

I, THE said Robert Westwood, do hereby declare that the nature of my said invention, and the manner in which the same is to be performed, is described and ascertained in the annexed diagrams, and the following explanations thereof. As the individual parts composing a watch movement are already well known and in use, I shall only describe the manner in which they are arranged and combined in my patent watches and timekeepers, which is as follows, (that is to say:—)

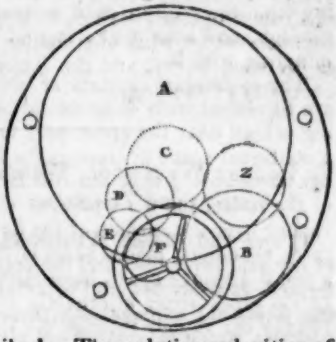
The frame consists of two circular plates, united by pillars, in the usual manner. Fig. 1, represents the pillar plate on which the calliper is drawn. The circle, A, represents the barrel; it occupies more than two-thirds of the diameter of the frame and the usual height between the plates, and what is usually termed a going barrel, having teeth on its edge, and constituting the first or great wheel. The circles C, D, and E, represent three wheels and pinions, usually denominated

Fig. 1.



in thirty hour movements, the centre, the third, and the fourth, from which they do not differ, as far as regards their uses: and the circle, F, represents the escapement wheel and pinion. These wheels and pinions are placed under the barrel, that is to say, between it and the dial plate, in cavities formed in the pillar plate, with cocks or bars to receive their pivots, the space between them and the upper plate being occupied by the barrel. The motion is communicated from the barrel to the wheels under it by means of an intervening wheel and pinion, represented by the circle, B. The teeth on the edge of the barrel act in the pinion B; and the wheel B, which is sunk, acts in the centre pinion. By referring to the diagram, Fig. 1, it will be seen that the diameter of the wheel B extends from its proper depth in the centre pinion to the edge of the plate; and as it cannot be placed at a greater distance from the centre of the barrel, it therefore limits the size of the barrel; but by introducing an additional wheel to communicate the motion from the wheel B to the centre wheel, there will be room for a barrel of still larger dimensions. Fig. 2, represents a calliper of a movement with the additional wheel, and a barrel of more than three-fourths of the diameter of the frame; the wheel B, (which is smaller in diameter than in Fig. 1,) acts in the pinion of the additional wheel, represented by the circle Z; and the wheel Z acts in the teeth of the centre wheel, which has no pinion, only a plain arbor. The additional wheel being under the barrel, is sunk, with its pinions in the same manner as the centre, third, and fourth, before described. The relative velocities of the centre wheel and barrel are the same in both callipers, namely, sixty-four to one. The ratios of the intermediate wheels and pinions may be varied without any material consequence. The upper plate receives the pivots of the barrel, arbor, and the pinion B, in both callipers, in the usual manner; and it also bears the jewelled cock in which the balance pivot acts. The points upon which I ground my right of exclusive privilege to the above invention and improvements under my aforesaid recited patent, are, the arrangement of the wheels and pinions, as far as regards their being placed so as to act under the barrel, that is to say, between it and the dial plate as before described and shown in the annexed diagrams, thereby admitting within the limits of a pocket watch of the usual size, a maintaining power of sufficient strength, with one winding up, to keep up a vigorous motion in the balance for the space of eight days, or for a longer period if required.

Fig. 2.



Observations by the Patentee.—The above invention is applicable

to all horological machines, wherein a strong maintaining power is required within a small compass; and is suited particularly to pocket watches, in order that they may require winding up only once a week.

The failure of all former attempts to make eight day watches, has been chiefly attributable to a deficiency in the maintaining power; but this defect is completely obviated by the above invention; so much so, indeed, that the eight day watches, on this construction, will be found to perform as well as the best thirty hour watches, while they have the additional advantage of not requiring the daily attention of the wearer to wind them up. [*Ib.*

To Robert Busk, *Gentleman, for certain improvements in apparatus used for Distilling.* Dated January 26, 1830.

The patentee states his object to be to cause the vapour proceeding from the still to pass several times in succession, both under, through, and over the surface of the liquid to be distilled, without mingling with it.

The apparatus consists of six horizontal chambers, all of which are furnished with communication and overflow pipes, the latter being placed near the upper part to regulate the quantity, and to leave a continual space or passage for the vapour. The cylindrical chamber immediately over the still is so constructed as to fit on the top of the latter, the neck passing through the bottom and emitting the vapour over the surface of the fluid contained in the chamber. The three chambers, placed successively over the one last described, and a small distance apart, have false bottoms, into which the communication pipes enter alternately at contrary sides; and similar pipes convey the vapour through the liquid to the space formed in the upper part of the chamber by the overflow pipes before mentioned.

The two uppermost cylinders are of much smaller dimensions, being intended for the vapour only, and having open vessels around them, into which cold water is admitted for the purpose of condensation. A long vertical cylinder, which the patentee terms the central chamber, passes through the centre of the five upper ones, and is firmly affixed to the outside or upper part of that attached to the still. A pipe, from the vat containing the wash, passes into this central chamber, and fills the remainder of the vessels, as also the still, by means of an overflow pipe in the form of a siphon, which acts when the liquid arrives at a certain point. Thus, when the operation of distillation is commenced, the vapour, by means of the communication and overflow pipes, and the false bottoms of the three chambers, is caused to pass alternately through, and over, the surfaces of the liquid contained in each vessel, and is exposed to nine different degrees of temperature before it is finally condensed.

[*Ib.*

To MELVIL WILSON, *Merchant, for an improved method of Cleaning Paddy, or Rough Rice.* **Dated February 6, 1830.**

IN the drawing attached to the specification of this patent is represented a beam or shaft, to which are attached four cranks, from which proceed an equal number of rods, having at their extremities a cylindrical piece of metal, about two feet in length, and of three inches diameter, the lower surface being made slightly convex. These form pestles, each of which works in a mortar of a peculiar construction, which appears to constitute the principle feature of the patent. A solid piece of metal to resist the action of the pestle forms the lower part of the mortar. A series of curved ribs of the same material are inserted in the solid stand; and around this framing, woven wire or perforated metal is affixed, thus combining a sieve with a mortar, the effect of which will be, that from the flour of the rice being expelled, the liability to clog the pestle and to heat the rice, is prevented; and as the great pestle and shaft, usually employed in machines of this nature, are dispensed with, the smaller pestles can, without any addition of power, be propelled with much greater velocity, without the danger of heating the grain. The perforations of the "sieve mortar" are directed to be made large enough for the passage of the flour, but at the same time too small for the rice.* [*Ib.*

FRANKLIN INSTITUTE.

Quarterly Meeting.

THE Twenty-seventh quarterly meeting of the Institute, was held at their Hall, October 21, 1830.

Mr. S. V. MERRICK, was appointed chairman, and

WILLIAM HAMILTON, recording secretary, pro tem.

The minutes of the last quarterly meeting were read and approved.

The quarterly report of the Board of Managers, and also that of the Treasurer, were read and accepted.

On motion, the report of the Board of Managers was referred to the committee on publications, with instructions to publish such parts as they may deem expedient.

S. V. MERRICK, *Chairman.*

WILLIAM HAMILTON, *Recording Secretary, pro tem.*

* This patent is manifestly taken for an American invention. By turning to vol. iv. page 49, it will be seen that "on the 17th of May, 1828, Mr. Ravenel (of Charleston, South Carolina,) obtained a patent for a mortar for cleaning rice. The bottom of this mortar was solid, but the sides were composed of wove wire, supported by ribs; this formed a sieve which allowed the flour, or dust which is formed in the pounding, to escape; which dust, in the ordinary mortar, causes the materials to heat, and greatly retards the operation."—EDITOR.

Twenty-seventh Quarterly Report of the Board of Managers of the Franklin Institute.

The Board of Managers of the Franklin Institute, in compliance with the requisitions of the constitution, offer to the society the following report of their proceedings during the third quarter of the present year.

The most conspicuous transaction of the last three months, was the exhibition of domestic manufactures, which was opened on Monday, September 14th, and continued for the five succeeding days. This exhibition, as regards the quality of the articles, in reference to their prices, the novelty of some of the products, and the evidences afforded of improvement in many branches of manufactures, has been highly creditable to American industry.

The greatest interest has always been displayed by the public in these exhibitions, and it is estimated that the last was visited by not less than 20,000 persons, all of whom appeared gratified by the beauty and variety of the articles, and the judicious arrangements under which they were exhibited. The benefit to the manufacturer from the opportunity thus afforded of making his productions extensively known, is too generally felt and acknowledged to render it necessary that it should be dwelt on, and yields every encouragement for the Institute to continue their exhibitions.

In the report of the committee on premiums and exhibitions, which the Board will lay before the society, will be found all the interesting details connected with the last exhibition.

The investigations relative to the value of water as a moving power have been prosecuted with unabated zeal and industry by the committee entrusted with the subject. The experiments on wheels of 15 and 10 feet diameter are completed, and a wheel of 6 feet diameter is now constructing. The committee will close their investigations on the completion of the experiments with this wheel, and the reaction wheel now making by Mr. Wing, of Gardiner. A report of their investigations is preparing, and the Board hope soon to present it to the society.

The inquiry respecting the causes of explosion of steam boilers has been industriously pursued by the committee appointed for the purpose, and the Board expected by this time to have laid the result of their labours before the society. But a communication has been had with the Secretary of the Treasury, which will probably lead to a fuller and more extensive and useful investigation than was originally contemplated, and which will postpone the period at which a report may be expected.

The regular winter courses of instruction have just commenced, and it is believed under very favourable arrangements. Instruction will be given in mechanics and natural philosophy, chemistry, mathematics, and architectural and miscellaneous drawing, by competent teachers, and at an expense to the students so moderate as to place it within the reach of every mechanic. The Board cannot urge too strongly on the society the importance of these schools, and refer to the published address and advertisement of the committee on instruction for further details.

The apartments in the Hall appropriated for reading rooms have been opened since the beginning of last month, and furnish to the members a useful and instructive place of resort.

The arrangements of the library are nearly completed, and in a few days the class of the library intended for circulation, will be opened to the members.

In concluding, the Board cannot but congratulate the society upon the continued prosperity and extended usefulness of the Institute, and urge upon them the importance of zealously pursuing to completion the various plans which constitute the objects of our association.

All which is respectfully submitted.

S. V. Merrick, *Chairman.*

William Hamilton, *Actuary.*

Report of the Committee on Premiums and Exhibitions, on the Sixth Exhibition of the Franklin Institute.

(Concluded from page 279.)

Documents annexed.

Extract from a communication on Silk, and Silk Goods, made to the Committee of Premiums and Exhibitions, by two of the Judges on those articles.

The undersigned have attentively examined the various articles contained in the catalogue submitted to them, and herewith returned, and on the whole they find ample cause to congratulate the country on the great progress which this most important branch of industry has made in the course of the present year.

Hitherto the exhibitions of American Silk have been chiefly confined to the sewing silk and twist, of which a considerable quantity is made in several of the states, but particularly in the state of Connecticut, where this manufacture has existed for the space of seventy years. But for want of the machinery which is used in Europe for doubling and twisting the threads of raw silk of which it is made, it is evident that it can never attain the required degree of perfection until the *throwsting mill* shall be imported and brought into use in this country. It is also to be observed that such silk is made with the best of the cocoons, which in Europe are used only in the preparation of silk for the manufacture of fine stuffs; of those stuffs which we import yearly from France to the amount of from eight to ten millions of dollars.

These facts have been made known to this country through a series of essays, which were published last year in our newspapers, by Mr. D'Homergue, with the aid of Mr. Duponceau, of this city; and being afterwards republished in the form of a pamphlet, have drawn the attention of the national legislature; one branch of which, the house of representatives, have ordered six thousand copies of it to be printed for their use, and have in contemplation measures founded on the suggestions of that book, the object of which is effectually to promote the growth and manufacture of silk in this country.

Mr. Duponceau and Mr. D'Homergue desirous of proving, by undeniable facts, the truth of the assertions they have made in the

essays above mentioned, and particularly the indispensable necessity of perfecting the art of reeling silk from the cocoons, before any thing can be successfully attempted in the way of manufacturing the article, have united their efforts to promote that desirable result. A filature has been established by the former of these gentlemen, under the direction of Mr. D'Homergue, in which ten reels are employed; each of which is worked by two women, whose labour Mr. D'Homergue superintends and directs. We have viewed this establishment, and have the satisfaction to state that it promises to be of great advantage to the country. The women appear pleased with this kind of labour, which is not at all fatiguing, but only requires that attention, and manual dexterity in which females generally excel. It is also not unhealthy, as it cannot be performed in a close building, but requires a place in which the external air is freely admitted. Therefore the filature is not in a room, but under a shed, entirely open on one side, and wherever else it is not necessary to exclude the sun in the hot days of summer. In rainy and damp weather, the reeling is suspended, and the women are employed in cleaning cocoons, or in some other preparatory work.

We have been thus particular in stating these preliminary facts, as we think they will lead to a clearer understanding of the observations we are going to make on the several articles deposited by Mr. D'Homergue at our last exhibition, which have principally attracted our attention; as they show the immense progress which, through his means, has been made in this country, in the short space of a year, in the art of preparing and manufacturing silk. Those articles are the following.

1. A reel for winding off silk from the cocoons made chiefly on the model of the Piedmontese reel, of which there is a silk manual, published in 1828, under the authority of congress, but much simplified, and in our opinion improved, by Mr. D'Homergue. It appears to work very easily; all the reels employed in Mr. Duponceau's filature, are on this model. He also exhibited an ingenious machine for winding and spooling silk, without making use of the spinning wheel.

2. Mr. D'Homergue also deposited 25 pounds of raw silk of the three qualities, singles, organzine, and tram. The material appears of the greatest beauty, and fully justifies the eulogiums that have been passed on American silk. As to the perfection of the reeling, it is sufficiently proved by the beauty of the stuffs made out of it, which will be presently mentioned.

3. Mr. D'Homergue, moreover, deposited by way of specimens, six small skeins of sewing silk, made by him out of imperfect cocoons, and waste and refuse silk, of which the material was at the same time exhibited; these skeins were dyed of various colours, by Messrs. Le Duc and Langueberg, of this city. Mr. D'Homergue not having had sufficient notice of our exhibition, had not time to make more. Although this sewing silk was made without the aid of a throwsting mill, (of which there is none in this city,) we are of opinion that it is equal to any imported. This offers a clear proof of the fact that the practice of making sewing silk out of the best cocoons, and the

best materials of the cocoons, is a ruinous misapplication of the gifts of providence.

4. But what attracted most our attention, as well as that of the visiters of our exhibition, was a splendid flag displaying our national colours, made by Mr. D'Homergue, entirely of American silk, reeled and prepared by himself. This flag is thirteen feet long, and six and a half wide, and such is the fineness of the threads of which it is made, that it weighs only nine ounces and a quarter. The stuff resembles that which is called Florence, of which great quantities are annually imported from France into this country; of the same stuff Mr. D'Homergue made and exhibited three beautiful handkerchiefs, one white, (the natural colour of the silk,) one blue, and the other red. The two last were dyed, and all three printed with elegant flowers round the edges and in the middle, by Messrs. Le Duc and Langueberg, whose colours are as lively and brilliant as any we have seen. It is to be observed that both the flag and the handkerchief were wove without passing through the throwsting mill, which Mr. D'Homergue asserts could not have been done with any other than American silk, and that any other silk would have become fuzzy by undergoing the operations of boiling and dying. We did not observe that this circumstance made any difference in the beauty of the tissue.

The manufacture of silk goods consists of three principal operations; the first is the reeling of the silk from the cocoons, in the form of a raw article for exportation or domestic use; the second is doubling and twisting the raw silk by means of the machine called a throwsting mill, making what is called *thrown silk*, which may be sold abroad or used at home; and the third, and last, is weaving the silk into various kinds of stuffs. We are happy to state that there will be no difficulty in introducing among us these two last branches of the silk manufacture, as well as that of dying in the beautiful colours of Europe. There are in this city, and no doubt in other parts of our union, skilful silk throwsters, silk dyers, and silk manufacturers, but, we understand, they cannot get employment for the want of raw material properly reeled, and we have reason to believe that it is extremely difficult to procure reelers from Europe, therefore we view with pleasure the establishment set on foot by Mr. Duponceau and Mr. D'Homergue, and hope it will be the source of immense benefit to our country.

The articles of silk manufacture deposited by others than Mr. Duponceau and Mr. D'Homergue, are the following.

No. 6. By young ladies in Connecticut, one bundle of sewing silk.

No. 213. By D. Bulkley, one box and one bundle of sewing silk.

No. 302. Five bundles of sewing silk made last year in Philadelphia, by Miss Mary Brash, under the direction of the silk society. The raw material was reeled with the Piedmont reel, the silk was twisted by the common spinning wheel. This silk was very good. The last, No. 302, was made in Connecticut; it is marked on the label, made by machinery; it is presumed to have been thrown or twisted by Mr. Beloe, an English silk throwster, who, it is said, re-

sides in Norwich, and has brought his machinery with him. It was fine silk. We think it proper to observe that all this silk was made out of the best silk of the best cocoons, while the specimens of Mr. D'Homergue were made out of imperfect cocoons and waste and refuse silk, and without machinery.

The silk suspenders, No. 5, by Mr. Joseph Ripka, and No. 182, by Mr. James Davis, are well manufactured, and deserve credit. The silk stockings, Nos. 123 and 125, by Mr. George Tupman, are well made, but of foreign silk, which costs $12 a pound. In Europe, suspenders and silk stockings, except the very finest, are made of floss and refuse silk.

The other articles do not appear to be made of American silk; but it is possible that some of them may be.

On the whole, we are of opinion that the specimens exhibited deserve encouragement.

Extract from the report of the Committee of Judges of the Cotton Goods exhibited at the Masonic Hall, on the 14th of September, 1830.

The committee to whom was referred the examination of the cotton goods exhibited at the Masonic Hall, on the 14th instant, under the direction of the Franklin Institute, respectfully report:

That the cultivation of cotton, in the United States, which has for several years been rapidly increasing, has become an object of the first importance, as furnishing the most valuable article of our exports, and as supplying a staple which is now manufactured at home to an immense extent.

The climate and soil of a large portion of the union being well adapted for its growth, the cultivation of it will continue to increase; and as the foreign market will only admit a certain quantum for its supply, it is of great importance that a regular and steady market for the surplus should be found at home. This can only be insured by extending our manufactures of this article in its various branches in our own country, thriving under the protection of government, and advancing by degrees so as to take in the whole range of cotton goods. The committee view with much pleasure the great improvement which has taken place within the last few years in this branch of our manufactures, and in the rapid progress which has been made in the different kinds of finer work. From the coarse brown shirtings, we have already advanced to cambrics of a handsome quality, and the improvement in prints and other varieties of the manufacture, is proceeding with a rapid pace.

To afford this branch of our manufactures an adequate protection, so that it may stand upon a firm and secure basis, and be further increased, is an object worthy the attention of our government, and interesting to every one who takes a pride in beholding our country advancing with a steady step to wealth and independence.

In the exhibition of cotton goods this year, at the Institute, the

committee have viewed the different samples which were submitted to their attention, and proceed now to submit the details of their observations in the order they occurred.

The bleached muslins manufactured by the Scituate Company, were the finest goods exhibited of their kind, and the brown shirtings from the same works, made of yarn No. 40, elicited the approbation of all who examined them.

The Phœnix shirtings were of good width and quality, creditable to the manufacturers, and calculated to maintain their standing in the public estimation.

The committee examined with pleasure some $\frac{9}{8}$ cambric muslins, made at Arkwright mills, and also some manufactured by Philip Allen. The fabrication of this article being as yet in its infancy here, there is of course much room for improvement therein; but the samples exhibited, although too heavy, afford evidence of what may be done in this description of goods, and the committee hope the time is not far distant when a much superior fabric will be produced by the skill and perseverance of our artisans. The demand for cambric muslins is very extensive, but those of $\frac{6}{4}$ width being much more desirable than those of $\frac{9}{8}$, the committee would recommend the manufacturers to turn their attention to the making of the former, not doubting but they will find their interests promoted thereby.

The reel of fine spun cotton, one pound of which, it was said, would extend to a distance of forty miles, manufactured by William Young & Co. being a new article, and intended to be used in the fabrication of what are termed Swiss muslins, which have not been hitherto made in this country, was noticed with much pleasure, and with the best wishes for the manufacturers' success.

Mott's spool and floss cotton, and wire thread, of which various samples were exhibited, afford evidence of attention and skill in this branch of manufacture, and may be safely recommended as very good of their kind.

The damask and plaid table covers, made by Mr. William Perry, are a new article, deserving of encouragement, and affording pleasing specimens of his taste and ingenuity. His $\frac{4}{4}$ ginghams are the first which have been exhibited, and a fair article.

The indigo blue checks, made at the Penitentiary, are a good fabric, but those exhibited by Groves and Fleming the committee consider as much superior to any which have been imported or manufactured here, and as therefore meriting their highest praise.

In the double blue, black and white, and lavender prints, made at the Eagle Print works, a decided improvement as to finish and execution is observed, and in the increased demands for them which will thereby be created, it is hoped the manufacturers will find an ample reward for their skill and enterprise.

The Merrimac five coloured prints, of which the committee regret that but one lot was exhibited, fully maintain the reputation they have acquired for beauty of style and excellence of fabric, while they furnish brilliant examples of the great improvement which, within a few years, has been made in calico printing in the United States.

The committee have noticed with much pleasure a considerable improvement in the manufacture and style of the four and five coloured prints made at Taunton, and they have great satisfaction in being able to pronounce that the single coloured prints made at the same place, (taking the price, which is 11½ cents, into consideration,) are better goods both as to style and fabric than any which they have heretofore seen in the Philadelphia market.

The single coloured prints made at Dover, N. H. by the Cocheco Manufacturing Company, are entitled to very favourable notice, for the cleanliness and neatness with which they are printed, and in point of fabric and execution being equal, if not superior, to any thing of the kind which the committee have seen, have been viewed by them with particular approbation. The coloured cambrics from the same works, are decidedly preferable to any which have been offered in this market, or heretofore exhibited, and are, therefore, recommended to the attention of the trade.

Marshall's ⅞ prints, of two colours, which were the only samples of this width exhibited, are made of good cloth, and the printing upon them is well executed.

The skill and perseverance of Mr. Joseph Ripka as a manufacturer, in producing so great a variety of cotton fabrics, have excited the best wishes of the committee for his entire success. His checked patent net and bird eye lenos, are beautiful specimens of their kind, and his efforts in fabricating the different species of this description of goods, are deserving of every encouragement.

A piece of Canton flannel, made by Mr. Dennis Kelly, elicited commendation for its beauty and finish.

The cotton quilt made of patchwork, by the children of the Northern Liberties and Kensington School, under six years of age, afforded a pleasing specimen of the advantages arising from the cultivation of early habits of industry, and of the useful manner in which children may be taught, in early years, to employ their time in a manner which yields amusement and profit.

Another quilt of the sunflower pattern, made also of patchwork, and containing, it was said, upwards of ten thousand pieces, afforded the committee ample proof of the patience, industry, and economical taste of the unknown maker.

In concluding their report upon the present occasion, the committee cannot refrain from expressing their high gratification in finding the cotton manufactures of the country in so improving a state, and they look forward with pleasure to the time as not far distant, when by the enterprise and skill of our artisans, this important branch of our national manufacture will vie in quality, variety, and extent, with that of any other similar one upon the face of the globe.

Extract from the Report of the Committee of Judges on Hardware.

Your committee of judges on hardware, beg leave respectfully to report:

As there has not been any regular list of articles exhibited, and the particular articles for which premiums will be awarded not being designated, we have thought proper in this report to notice the articles generally, giving our opinion more as to their being merchantable, than their actual utility.

The first article we shall notice, will be the 4 wrought vices from Pittsburgh; these are certainly worthy the attention of mechanics, being well made and finished in a workmanlike manner. One decided advantage over the ordinary English, or even the best tower vice, is that of the screws of the box being cut, which in the English is but soldered in, thus giving a greater durability to that part in which it is most desirable.

Of the cast vices, but little can be said by this committee; the committee on machinery must act upon this; as it is entirely new it must be proven by actual experiment.

The hollow ware made by Seth Boyden is a light and handsome article, and if its lightness does not add to its tenderness, must supersede the common heavy ware now in use. This maker's sad irons are also a good article, and would compare in quality with the celebrated Colebrook-Dale Company's, (not having the price, we can form no opinion in that particular.) In the article of cutlery, the makers (Moss & Co.) have certainly succeeded in producing an article which we have no doubt is good. This is also the case with L. Goujon's wood screws.

Mr. Fiss has also produced a specimen of his workmanship in an article of drawing knives, which has every appearance of being good.

The pattern card of Hovey's plane irons represents very fair tools, which may probably be very good. The pattern card of Clark and Brown, deposited by Goodyear, such as nippers, plyers, &c. represent goods which some of your committee have found quite merchantable. Linley & Co.'s articles of squares, will vie with the best of the English make.

The screw augers made by G. Shetter, being upon a new plan, are worthy the attention of the committee on machinery, as well as the elegant assortment of planes. The variety of locks, as exhibited by Messrs. Day & Co. M. Kates, and Job Baker, does them much credit. There was a number of other articles which we were pleased to find attracting attention, such as Dunlop, Madeira & Co.'s tools; shovel and tongs, and steel shovel and spades by Gleason; hay and dung forks by Goodyear; gilt buttons by Robinson and Schovill; long saws by Rowland. But as most of these have been particularly reported on at former exhibitions, we have deemed it unnecessary to say more at the present time. The waiters must claim some attention; Nash, Ogle, Mustin, and Blackmore, show fully that if they have not arrived at the perfection of the English, they are approaching them by rapid strides. Your committee find a difficulty in entering into a comparison with the different makers of the same article, on account of their not having given their prices. In future, a better plan would be, for depositers to attach the prices to their various articles. In closing this report, your committee must say that the department

with which they have been honoured to pass judgment, has been very creditable to the Franklin Institute.

Note by the Committee of Premiums and Exhibitions.

The Board of Managers at their meeting held October 14th, adopted the several resolutions proposed in the above report, as well as the recommendations for silver medals, which were awarded to the persons therein designated. The medals will be prepared and delivered as soon as possible; due notice whereof will be given.

The committee were further directed to have their report published, and in complying with this direction, they wish it to be understood that they do not hold themselves answerable for all the opinions contained in the reports of the judges, as they embrace some points on which the committee deem it inexpedient or improper for them to express themselves; but they publish them on the responsibility of the very respectable sources from which they emanate.

Monthly Meeting.

The stated monthly meeting of the Institute was held at their Hall on Thursday evening, September 23, 1830.

Mr. S. J. Robbins, was appointed chairman, and

Mr. F. Fraley, recording secretary pro tem.

The minutes of the last meeting were read and approved.

The following donations were presented to the Institute, viz.

By Mr. P. Barton.

Elements of Botany, or Outlines of the Natural History of Vegetables.

Flora Virginica.

A Discourse on some of the Principle Desiderata in Natural History.

New Views of the Origin of the Tribes and Nations of America.

Observations on some parts of Natural History.

Fragments of the Natural History of Pennsylvania.

A Memoir Concerning the Disease of Goitre as it prevails in different parts of North America.

A Memoir Concerning the Fascinating Faculty which has been ascribed to various species of Serpents.

Written by the late Professor Barton.

By Mr. James Crissey.

Goldsmith's Works.

The corresponding secretary laid on the table the following works, received in exchange for the Journal of the Institute, viz.

The Magazine of Useful and Entertaining Knowledge, for August.

The American Quarterly Review, for September.

The North American Review, for August, 1830.

Southern Agriculturist, for 1828, 1829, and the first 7 Nos. for 1830.

London Journal of Arts and Sciences, for July and August.
The Mechanics' Magazine, for July.
Gill's Scientific, Technological and Microscopic Repository, for July.
The Register of Arts and Journal of Patent Inventions, for July and August.
The Repertory of Patent Inventions, supplement to 9th vol. and No. for August.
Recueil Industriel, for May.
Annales de Chimie et de Physique, for April.
Annales des Mines, Vol. 6, No. 6.
Bulletin de la Société d'Encouragement pour l'Industrie Nationale, for April and May.

The committee to whom was referred the rules for the government of the library and reading room, reported the regulations, which were read, and after some amendments, were adopted.

The committee appointed to report queries for discussion at the meetings of the Institute, presented the following, which were read, and ordered to be recorded for discussion, viz.

What proportions of lime, clay, and oxide of iron, will constitute the most fusible compound?

In what proportion to the metal ought this compound to be, to facilitate to the greatest extent the smelting of iron, and to defend the melted mass?

The subject of the explosion of the boilers of steam engines was taken up, when Mr. Keating addressed the meeting, and gave an account of the explosions on board the steam boat United States, and on Lake Erie. Professor Johnson also addressed the meeting, and read a series of questions and answers on the subject; he also gave an account of Mr. J. J. Rush's plan for preventing accidents in boilers by the collapsing of the flues. Several other gentlemen also spoke on the subject, after which the further discussion was deferred until the next meeting.

S. J. Robbins, *Chairman.*

F. Fraley, *Recording Secretary pro tem.*

TO THE MONTHLY MEETING OF THE FRANKLIN INSTITUTE.

On the Explosion of Steam Boilers.

The inquiry on the subject of steam boiler explosions, now pending before this Institute, and which is understood to be the topic for discussion this evening, is unquestionably of more importance, particularly as it regards the community, than any question that has hitherto engrossed its attention. The primary object of attainment, is the preservation of human life.

The explosions that have so recently and repeatedly shocked the ears of the public, have also had their effect to create and foster a popular feeling of prejudice against the employment of steam engines, especially for purposes of locomotion. To allay this excitement, therefore, and to render the engine as harmless as it is powerful, is

an endeavour peculiarly worthy of this Institute, as its accomplishment must tend in an eminent degree to place this most important auxiliary, the *primum mobile* in the mechanic arts, upon that footing which its utility so justly demands.

The information that has already been afforded at several of the past meetings, by the members who have taken part in the discussion of this subject, must have fully shown that ample room exists for improvement. That some of this improvement may readily be effected by legislative enactments is reasonably admitted; it would, however, be regretted, should undue fears and prejudices subject this invaluable machine with an encumbering load of legal friction.

That a boiler well made and of suitable materials, kept constantly clean and free from sediment, with a safety valve of proper proportions and prudently loaded, and having always a sufficiency of water above the fire surface, should ever explode or burst, is indeed a paradox.

A communication in relation to the materials for boilers has recently been made to this meeting. Ocular demonstration has also been shown of the effects to be apprehended from the accumulation of sediment; and some pertinent remarks made in reference to the use and application of halliards to the safety valve. In this communication, therefore, I shall merely advert to one or two particulars which appear to have a connexion with these subjects, and then pass to the consideration of the quantity of water in a boiler, and the several means for its determination.

What method is best adapted to prove, occasionally, the requisite strength of boilers, is believed to be a query worthy of particular notice. The expensiveness of these articles is no inconsiderable drawback to their renewal. Few individuals can be disposed cheerfully to incur this, so long as there remains a ray of hope to defer it, hence it is not uncommon to find boilers used until they have become reduced to a mere shell.

Now as every steam engine is furnished with a forcing pump in connexion with its boilers, a very simple and effectual test is suggested, which may be resorted to with much facility. With boilers that have been long in use, something of this kind seems particularly called for. That this mode of proving might be carried to excess, and the boilers strained, cannot be denied. But that if it be reasonably made, it would be safer, surer, and less injurious to the boilers than by the ordinary mode of proving with a hammer, is on the other hand equally clear and certain. On this account it might be urged, whether the interest of the proprietors would not be promoted by the adoption of the hydrostatic proof.

The safety valve being the only vent to the boiler when the throttle valve is closed, it is all important, therefore, that its construction be such as not to engender the least derangement in its operations. Instances are recorded of these valves sticking, some in an extraordinary manner. This has been accounted for on the supposition of a glutinous matter being formed on the seat of the valve, arising from the use of meal, &c. in the practice of stopping leaks in the boiler.

It is rather unfortunate that the accounts given of these events have seldom been accompanied with such data as might enable others to prevent a similar occurrence. We have instances of the safety valve sticking, when thrown, by the effort of the steam, considerably above its seat. Effects of this kind may be accounted for, by the position which the link that connects the spindle of the valve, with the lever or spanner, might assume, nearly horizontal, or such that the weight on the lever would tend only to bind the spindle between the bridges. It is not improbable that something of this sort may take place when the valve is in its seat; for the link being short, but little wear, or looseness, on the pins, will cause the weight on the lever to press obliquely against the spindle of the valve, and thus produce the effect.

It is believed to be a current opinion, that what is properly termed an explosion, universally originates from an insufficiency of water in the boiler. That the upper part of a boiler charged with steam may become red hot when immediately acted upon by the fire, may be satisfactorily shown by a simple experiment with a small vessel in which steam may be formed, by a lamp, and a blowpipe. We have, however, ample testimony that this effect may be produced on a larger scale. Instances are mentioned in the paper of M. Arago, published in the last July number of this Journal. To this paper I may also refer for the experiments of Perkins in support of the instantaneous formation of steam, a matter of the greatest moment in the exposition of steam boiler explosions.

The fact of the *foaming* of certain liquids, hinted at in the above mentioned essay, experiments with a glass boiler will prove substantially correct. In addition to the liquids therein named as producing a commotion more violent than pure water, viz. sulphuric acid and milk, we may mention those of salt and muddy water, which will operate thus, in proportion to its specific gravity.

With a transparent boiler it may be seen, that when the water is made to boil under a certain pressure, the bubbles of steam which are continually ascending, produce a current from the sides of the boiler, towards that end where the fire acts with the least intensity. If the pressure be increased, this effect for a short time ceases, the water becoming completely dormant. On the contrary, when the pressure is suddenly removed, the bubbles ascend with great violence, changing the body of water into *a froth, and raising it considerably above its former height.*

This effect will be produced whether the safety valve, throttle valve, or gauge cocks be opened, and it deserves particular notice, as it must show how precarious and uncertain the latter instruments may be to indicate the real height of the water in boilers.

Various contrivances have been proposed, with a view to obviate this difficulty with the gauge cocks; few, however, have as yet been brought into general use. The best, (in theory,) of these substitutes, is perhaps that of placing a glass tube in front of the boiler, with one end of the tube communicating with the water, the other with the steam. Whether so fragile a material as this can be employed with

safety for the above purpose is left for experiment to decide. With the small glass boiler already referred to, thirty pounds to the square inch has been borne without fracture.

Among the numerous improvements in the steam engine, by Mr. Watt, we find that of a contrivance very simple in its construction, by which the engine is enabled to feed the boiler with the necessary quantity of water. This contrivance is doubtless familiar to every one. It is applicable to low pressure engines only, and for a reason sufficiently obvious, has seldom, if ever, been used, but with such engines as are of the stationary kind. A feeder on Mr. Watt's principle, with the original pumice stone float, is at present in use at the Globe Mill, in the vicinity of this city. In vol. iv. page 347, of the Journal of the Franklin Institute, a brief description is given of a feeder, invented by Mr. Doolittle, of Bennington, Vermont. As this contrivance appears to have been before the committee of inventions of this Institute, it will be unnecessary here to give it in detail. It will suffice, therefore, to observe, that this feeder, like that of Mr. Watt, has its regulating cock (or valve) between the forcing pump and the boiler, and that the pump must be continually urging towards the boiler its maximum quantity of water, whether the boiler is in a state to receive it or not.

The following drawing exhibits a small experimental steam engine, with a feeder connected with it, which acts in a manner entirely different from either of the preceding. This feeder has been found to answer its purpose in the most satisfactory manner, without any peculiar nicety of workmanship in its construction.

References to the Figure.

A, B, the furnace.

C, D, boiler; this consists of a large three necked glass bottle, commonly known by the name of Woolfe's bottle.

E, F, a box or cistern to contain water for the supply of the boiler. The waste steam of the engine is also thrown into this box.

P, the forcing pump, *f*, *f*, the feed pipe leading into the lower neck of the boiler.

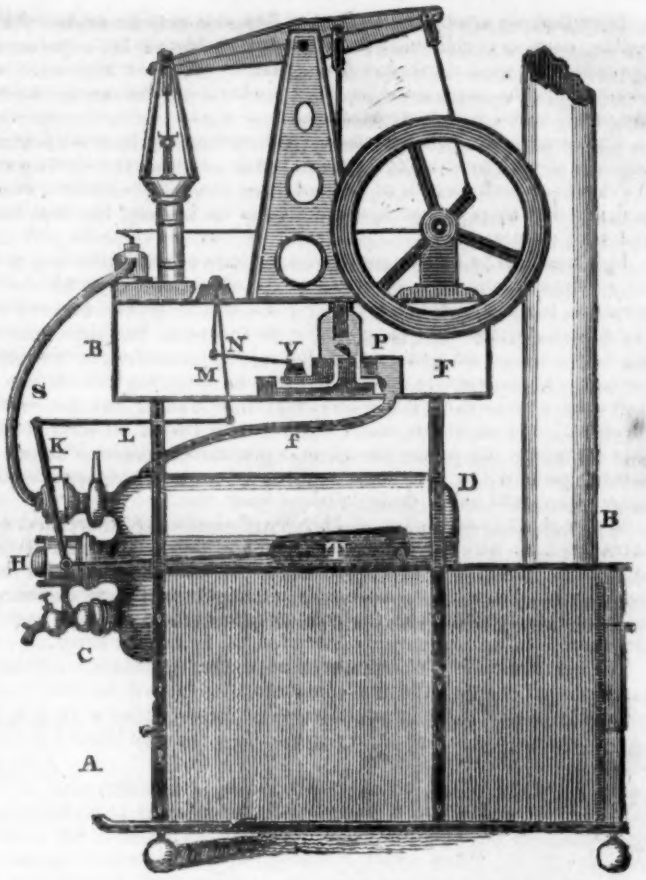
S, steam pipe.

H, a cap fitted on the middle neck of the boiler, in which the spindle of the float works.

T, the float.

V, a slide valve. This valve is made of a flat piece of brass ground true to its seat, and is intended to open or shut the communication between the pump and cistern.

K, L, M, N, the connexion between the float and valve.



For a more detailed description of this feeder, I beg leave to refer to the communication published in the last July number of the Journal of this Institute.

It will be perceived that the above feeder depends for its action upon the buoyancy as well as the gravity of the float; it is therefore believed that a wooden body bound or sheathed with metal, will be as suitable for the float as any that may be devised. Should the float become heavier by absorbing the fluid on which it rests, the effect would be to keep the water in the boiler, at a greater height above the fire.

That the float may have sufficient play in boilers having flues passing through them, the rod upon which it acts may be forked, with a small float on each prong, so as to straddle the flue. For a vertical cylindrical boiler, a float of an annular form is suggested.

Now that we are on the subject of floats, it may be observed that hollow copper vessels have been tried with Mr. Watt's feeder, but the difficulty with these has been, that by frequent expansion and contraction, the parts soldered together have opened so as to cause the vessel to fill with water and sink.

The pumice stone is sometimes objected to, as its gravity is susceptible of variation, by the accumulation of sediment in its pores. As this float, however, is at present used for Watt's feeder, we apprehend that there is not much difficulty in keeping the float clean and well counterpoised.

It is needless to insist upon the importance of a good forcing pump for an engine, with or without a feeder. The manner in which it is proposed to construct the working parts of the feeder exhibited by the drawing, it is believed is such as to create the least possible friction or hinderance to its operations; the amount of friction to be overcome at the spindle on which the float acts, may be readily inferred by a reference to the common throttle and governor valves, the spindles of which are fitted in the same way. Another advantage attending this arrangement, it is presumed, will be, that as the rubbing part of the spindle is constantly covered with packing, no impediment will be so likely to occur from rust.

In the usual construction of Mr. Watt's feeder, the wire that connects the float with the valve, slides up and down through a stuffing box; here, in addition to the pressure of steam that must be contended with, the wire is continually passing from the atmosphere of steam within the boiler, to the common atmosphere without, and liable, therefore, unless properly attended to, to become rusty.

The other parts of the feeder need no further explanation than what has already been given in the communication above referred to, we wish only to repeat, that this contrivance can only feed so long as the pump or engine is in operation; it will, however, be a *tell-tale to the boiler under all circumstances.*

An objection is not unfrequently made to improvements of this kind, on the supposition of their having a tendency to make the engine men careless and inattentive; to this objection it has already been answered, "it is a very mistaken idea, that because steam engines usually move without attention to them, such attention is not required."

All of which is respectfully submitted.

Charles Potts.

Philadelphia, October 27, 1830.

Remarks on the frequent Explosions of Steam Engine Boilers in the United States, and on the construction and operation of two boilers now in use. By D. J. Burr.

TO THE EDITOR OF THE JOURNAL OF THE FRANKLIN INSTITUTE.

Sir,—With much pleasure I see announced the determination of the managers of the Institute, to investigate the causes of explosion of

steam boilers, and, if possible, to devise some adequate remedy or preventative for an evil so alarming. The occasion is the more urgent, as it seems not improbable that competition induces the owners of "low pressure" boats to encroach somewhat on the prerogative of their *more pressing* compeers; and there is so much temptation to progressive improvement in that particular, that we may expect to hear of, if not to experience, the consequences, in more frequent and horrid detail, from year to year.

It cannot but have occurred to every one conversant with this subject, that while in our country, explosions are frequent and dreadful, we hear of no similar catastrophes in Great Britain; and we are led to inquire, what regulations have been adopted and legalized there? and how far may those rules have contributed to this exemption? If on this point it be said that British steamers are universally of low pressure, it should be recollected that our "low pressures" are not exempted from casualty, and that *theirs* are employed almost exclusively in sea water; and a great proportion of them having iron boilers, it might be apprehended that corrosion would be rapid, and the materials would eventually become deficient, and give way.

The same observation, however, applies with equal truth to high pressure steam in Great Britain; and if the inquiry be made why they are exempt from such terrible disasters as occur in this country, not seldom even on land, the answer may probably be, that *their* high pressure is limited to 50 lbs. to the inch, while ours is very commonly three times as great; and as it can hardly be expected that accidents will not sometimes occur, so it must be supposed that as more powerful steam is used, explosions will be more than proportionably frequent and dreadful in their effects.

Provision by law for a strict original survey, and for subsequent frequent proofs, is, perhaps, necessary, and would be most effectual in connexion with such other guards as are obvious, and have often been proposed.

I am aware that what is said above would appear trite if offered to the committee, or to any person well informed on the subject: but this is a matter of public concern, and the public need information. No danger is so alarming as that of which we know not the nature and extent; and it is only by a fair exposition of facts that the general excitement and apprehension can be restrained within rational limits.

But the committee want facts, and on a matter of such great importance, it is hoped that no one will withhold any thing calculated to bear on the questions at issue. In giving my small stock of information, I premise that, although familiar with steam for some years past, I *know* nothing of it as used at 150 lbs., or, indeed, any thing over 50 lbs. to the inch. That it will continue to be used at the highest practicable extreme on our western waters, and wherever freight is a prime object, we need not doubt; but that it will be so employed without ultimate dire disasters from the gradual corrosion and weakening of the boilers, we have no reason to expect. With this impression, however, I cannot but consider the use of such high

steam on land, as of very doubtful expediency, involving a risk but poorly compensated by the economical advantage.

I shall now state some facts to prove that the tremendous explosions now of so frequent occurrence, do result chiefly, if not entirely, from the use of steam of excessive power.

The boiler of a high pressure engine, (not new,) working at a coal mine in this vicinity, is of wrought iron, $\frac{5}{16}$ thick, and supplied with "copperas" water so slightly impregnated, that it is commonly drank by the workmen. After a few weeks from the commencement, it was discovered that the boiler plate immediately over the fire place was cracked and leaking. The steam was limited by the safety valve to 50 lb. the inch, and the engine at full work: the leak continued for several days without material increase, and the boiler was then repaired with a large and good plate, and it was then ascertained that the front end of the boiler being rather lowest, a considerable deposit similar to iron rust was made at the place where the old plate was burned.

In the course of four or five weeks more, it was perceived that a blister was raised on the new plate, and as the engine could not be dispensed with, and the means for repair were not at hand, the protuberance daily increased until it became, as the fireman expressed it, as large and deep as a hat crown. In about ten days it burst, while at full work, and the iron was found to be attenuated to less than $\frac{1}{8}$ of an inch at the thinnest part. The explosion, if such it can be called, was entirely harmless, no one happening to be at the front end, and neither the boiler nor the bricks of the furnace were disturbed.

The boiler was then taken up, repaired, and improved by adding several transverse pipes of cast iron, on a plan similar to the boilers of Woolfe's engines, in Wales. The engine has been running since, about 6 months, and doing well; the pipes being regularly and conveniently cleaned, and there is no appearance of injury, or apprehension of failure.

What remains of my experience as applicable to the inquiry before us, will be best given by a short description of the peculiarities of a small engine attached to the Richmond foundry, which has been used for 12 months past.

The boiler is a cylinder, to which transverse pipes are attached below by short necks, on the plan mentioned above, but on the whole length; these pipes are covered with fire bricks, and the spaces between the necks are closed. The fire acting first below the pipes, returns above them on one side of their necks, and passes off by the other side. This boiler appears to be in some respects peculiarly safe, viz. the cylinder is not likely to be heated dangerously hot, although it should be quite emptied of water. The pipes which are exposed to the most intense heat, are least likely to be empty, and being weakest, would yield first, probably without injury, except immediately in front of the furnace, and experience has indicated a safeguard against this possible danger. On one occasion, by the negligence of the fireman, the water was suffered to exhaust, until

the pipes became empty, and this fact was announced by steam issuing from one end of a pipe where it was found that the pasteboard with which the joint of the cap or cover was made, had become charred or burned by the heat of the pipe, thus giving vent to the steam, and alarm to the fireman. The furnace was cleared, the defected joint repaired, water supplied, and the engine in operation again in ten minutes.

In addition to the usual gauge cocks, and for greater safety, there is attached to this boiler a float with a lever, intended to operate in the mode described in your Journal for July, of an improvement by Mr. Potts, with this difference, that it was arranged to regulate a *waste* cock, by which surplus water should be returned to the hot cistern. This has not been completed, because it is found that the float is so much agitated, probably by the ebullition from the pipes; that it is considered rather unsafe to rely upon it. For economy of fuel, I consider this boiler equal to any I have known in use; it occupies less ground, and the reports of the performance of Woolfe's engines, at the Cornwall mines, and the long time they have been used, seem good proof of their safety, utility and economy.

Respectfully yours,

D. J. BURR.

Richmond, Va. October 9, 1830.

Reply to the remarks of "A Manufacturer," on an improvement in Piano Fortes, patented by C. P. SAKMEISTER. *By the* PATENTEE.

TO THE EDITOR OF THE JOURNAL OF THE FRANKLIN INSTITUTE.

SIR,—In the September number of your Journal, I noticed some remarks on C. P. Sakmeister's improved piano forte, said to have been made not insidiously, and charging the said Sakmeister directly with having revived modern antiques. I trust you will be so kind and impartial as to admit this communication in refutation of an anonymous article, assailing my reputation as a mechanic, under the signature of "A Manufacturer," thereby insinuating that as such, he ought to be a judge of what he writes about; but if his pianos, or whatever he may manufacture, are not better than his reasoning, or cannot stand the test of time better than his assertions can of truth and veracity, it will not be impertinent to predict that they will soon be deservedly condemned and forgotten. I should not have condescended to vindicate my reputation against an anonymous, and, I think I may say, a malicious writer, had not the article appeared in your widely circulated Journal.

How far there is even a shadow of truth in *A Manufacturer's* statements, I shall leave the public to judge, after having made a few remarks. It evidently appears *A Manufacturer* is not acquainted with the different piano forte actions, where he says that "the simple catch attached to the key is certainly preferable," and again, "by taking off the top of the action, each key may be taken out." Now, sir, permit me to say, it never has been before successfully attempted

to introduce the catch (or check) in the English action. In the action now made by Stewart, Clementi and Broadwood, and now made from them in the United States, although the catch is introduced in that action, yet it is of an entirely different mechanical construction. In the action to which I affix my catch, each key can be taken out without deranging any part of the same, and I cannot possibly conceive how "perplexity" can exist; moreover, the patented improvement of my catch consists only in adding a thin wire to each key, which pressing the lever catch against the hammer, prevents the same from rebounding even in the quickest movements.

A Manufacturer wishes to have it believed that the Messrs. Loud have made this invention long since, but I can prove by many persons, that only after much time and many trials, could I attain that perfection for which I took out my patent, and shall not abandon the same until I see more proofs than the assertions of a nameless Manufacturer, who, I shall show in the sequel, hesitates not to misrepresent what he is well aware to be matter of fact. From what has been said, I presume no person will doubt that a great improvement has been made, first, and only by me; and if, as *A Manufacturer* acknowledges, the improvements of Messrs. Loud have been laid aside by them, I can assure *A Manufacturer* that I have no thought of laying mine aside, no derangements as yet having taken place, and it is probable never will. I would, however, advise *A Manufacturer* to arrange this point with the Messrs. Loud, and not with me, till he can convince any one that their improvement and mine are alike.

A Manufacturer's remarks on the English action are obviously to mislead the public; he stops not there, but asserts what he must know to be a falsehood, if he (as he says) has seen my specification. I never therein laid claim to the invention of a hammer, as he remarks, "such hammer as I claim (the hammer of the inverted action) had been made before me by Mr. Albrecht," thereby clearly saying I claimed the invention of the hammer, when I never in my patent even alluded to it. I claimed as my invention the construction of the hammer shank, and through its form making the jack of my action produce an immediate effect on the hammer; and also applying to this action the lever catch of my invention, as used by me in the English Action piano fortes, producing by the combination (though certainly not a "perplexed" one,) of the jack, hammer, and front catch, a powerful and quick action; how far I have succeeded, those who have seen my piano fortes are the best judges, and here I shall leave *A Manufacturer* with remarking, first, that I shall not reply to any remarks of his, excepting he appears under his own signature, having neither time nor inclination to enter into discussions with nameless writers; and, secondly, being convinced that I have substantial and just claims to my patent, I shall prosecute all infringements on the same, by law.*

Yours respectfully,

CHARLES P. SAKMEISTER.

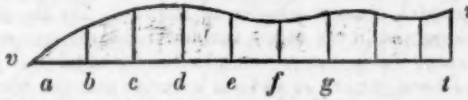
New York, November 1, 1830.

* For remarks by the Editor, see page 359.

On finding the Area of an Irregular Curved Figure.

TO THE EDITOR OF THE JOURNAL OF THE FRANKLIN INSTITUTE.

SIR,—I believe the following method of approximating to the area of an irregular curved figure is not generally known. If you think it worthy of a place in the Journal, you will oblige me by inserting it.



Let v, u, be the boundary curve, to any figure v, u, t; a, (in this case $= 0$) b, c, d, e, f, g, &c. be given perpendiculars from the base line v, t, at any given equal distances, to meet the curve. Put n for the equal distances, and the area required $= s$. Then by the property of the trapezoid, $\frac{na + nb}{2} + \frac{nb + nc}{2} + \frac{nc + nd}{2} + \frac{nd + ne}{2} + \frac{ne + nf}{2} + \frac{nf + ng}{2} = s$—reduced gives $s = \frac{na + 2nb + 2nc + 2nd + 2ne + 2nf + ng}{2} = a + 2b + 2c + 2d + 2e + 2f + g \times \frac{n}{2}$.

Rule.—Add all the perpendiculars twice over, except the first and last, which must be taken but once; this sum multiplied by half the equal distances between the perpendiculars, gives the area.

The writer of the above has often made use of this rule with much satisfaction, particularly in land surveying, where the boundary lines fell upon water courses or curve fences. It may likewise be applied to find the contents of all irregular solids, the superficial contents of their surfaces, and in finding the contents of irregular excavation where the bottom is curved, which is often the case in mill races, canals, &c. In surveying, it is obvious that there is no occasion to note down in the field book the bases of the trapezoids, as is necessary in the old and tedious method of taking offsetts, nor yet to make separate calculations for each trapezoid; all a surveyor has particularly to attend to, is to notice whether the curve is very concave, or convex, from, or towards, the base line, and to place the perpendiculars nearer, or further apart, so as to approximate to the area more accurately.

W. B.

Note from Professor HARE, *to* Mr. J. P. MORRIS, *relative to an explosion which occurred in the Pipe and Drum of a Stove.*

September 28th, 1830.

SIR,—During the last winter, when I was too much engaged in the preparation of the experimental illustrations required by my lectures

to withdraw my attention; you requested that I would explain the cause of an explosion which occurred in the pipe and drum of an anthracite stove. I believe the circumstances were as follows. The fire having nearly burned down, but not being quite extinct, a considerable quantity of old paper was thrown into the stove. An explosion soon after ensued, by which the drum was ruptured, and other derangement produced.

The rationale I conceive to be as follows. By the heat of the fire which remained in the stove, carburetted hydrogen was evolved from the paper, but happened not to be inflamed until sufficient quantity had been generated to form with the atmospheric air in the drum and stove pipe, an explosive mixture. An analogous result upon a more limited scale may be frequently observed when paper or shavings are thrown upon a fire where there is no flame so situated as immediately to ignite the gas evolved. If a piece of paper had been lighted beforehand, and thrown in on the top of the mass, the explosion had been prevented

Sir, your obedient servant,

ROBERT HARE.

On the manufacture of Red, Green, Yellow, White, and other Enamel Colours, and the manner of employing them.

[Translated from the *Dictionnaire Technologique*, for the Technological Repository.]

[Concluded from page 262.]

On White Enamel.—Although white is not a colour, properly speaking, yet it is made great use of in painting upon glass, in enamelling and porcelain painting, and is the natural foundation of those bodies which are white; and we often use this colour under those circumstances in which white is to be figured; it is also employed to represent certain draperies, and generally appears a little raised, in all the pictures upon enamel or porcelain, and we are always obliged to have recourse to it in the management of the tints; in this case, the white is exceedingly useful.

The white enamels are those bodies which are most proper to produce clearness; but as they are, as we may say, composed with silex, so they present great difficulties in their employment with the pencil; and, therefore, those who are occupied in the preparation of colours, have turned their thoughts to other substances, which might replace the white enamel. On this occasion, M. de Montancy, who I have the pleasure to cite as one of the chemists who have rendered the greatest services to this art, having perceived the great importance which would result from our possessing a white not vitrified, for the use of enamel painters, has lately, by many experiments, and great labour, created that which we so ardently desired. I have repeated his processes, and also executed them in different manners, by which I think I have simplified them, or, at least, rendered them much more certain.

We must procure the finest tin, that from Banca or Malacca, and reduce it into very thin sheets, either by the hammer, or the laminating mill; these sheets are then to be cut into small bits, and introduced into a matrass, containing a certain quantity of nitric acid diluted with water. As the tin falls down in the matrass, we see a great effervescence produced, with the disengagement of caloric; in proportion as the solution is effected, there is deposited upon the bottom of the matrass a deutoxide of tin, of great whiteness. We continue the operation until we see that enough of the oxide is procured; we then pour water upon the precipitate, shake the matrass strongly, and pour out its contents into a glass or porcelain vessel; we then repeatedly wash the deposit with fresh portions of boiling water, and then leave it to drain upon a white paper.

When the precipitate is quite dry, we mix it with a little less than its weight of the hydrochlorate of soda (common salt,) very white and crystallized; we then reduce the whole into an exceedingly fine powder, which we pass through a silken sieve, in order to mix it intimately; we then put it into a new Hessian crucible, and expose it to the fire in a furnace for three hours, of which the first two are gentle, in order to permit the perfect calcination of the materials; we then withdraw the crucible, and leave it to cool. We must observe in breaking it, in order to detach its contents more completely, to take every possible precaution that not the smallest particle of the earth of the crucible be found amongst the mass.

We then pulverize this mass anew, which will be of a shining white, if the operation has been well conducted. We then place the powder upon a glass slab, and grind it with a mullar of the same material, with water, until it appears like cream; we then put it into a large porcelain vessel, wash it many times with hot water, and throw it upon a filtre; the white, which remains upon the filtering paper, must then be dried in a gentle heat. It often happens that the great whiteness of this substance does not develop itself before these last manipulations.

We see of what importance it is to possess a colour like this in vitrifiable painting, both in enamel and on porcelain. In fact, there are but few colours used in these arts, which do not frequently require to be modified in their intensity. The pure tints have, without doubt, the greatest splendour; but the half tints often require raising. I know, indeed, that in this respect, a colour applied thinly, and greatly extended, becomes paler, and possesses a demi tint; but it also loses its brilliancy considerably, owing to the little flux which it contains; instead of which, we unite it with another colour, which reduces the too great liveliness of the tint, although it still possesses that brilliant character which we so highly prize, and is constant in this case, which is a marked advantage. I know that these ideas are contrary to those generally entertained, as they pretend that red becomes a flesh colour, by the means employed to lighten its tint; but experience has proved, that the thing is possible, and can certainly be executed. But we have seen in practice, and as we have before said, that to imitate flesh colours, we must employ a

colour which is nothing else than the red from iron, in which there is always a notable quantity of alumine, which, by its whiteness, lowers the intensity of the red, a property which the white oxide of tin, which we have been describing, possesses in the highest possible degree, not only when opposed to red, but also to all the colours which compose the palette of the painter by vitrifaction.

Of Black Enamels.—Black, in the opinion of philosophers, is no colour; but, on the contrary, is the absence of all that exist, or is the deprivation of light. It seems, on a first glance, that such a colour might be easily composed; nevertheless, we experience many difficulties in attempting to succeed therein; as we have two evils to overcome, which are, its dryness under the pencil, and the little intensity of the tint. In fact, if the flux predominate too much, we fall into both inconveniences at once; if we would remedy it by diminishing the quantity of flux, or, still better, by augmenting the quantity of the oxides, we fail alike, and obtained a dead colour, which has no splendour, and which, of course, is unfit for our purpose. If indeed we could pursue a middle course, we might attain our end; but this middle course is difficult to find.

Three metallic oxides concur to form black enamel; these are, the oxide of manganese, that of copper, and that of cobalt. These three oxides likewise contain the elements of the three primitive colours, as we shall see below; so that it would seem easy, by mixing blue, red, and yellow, to form a fine black. Nevertheless, it is not exactly so, as the black produced by the mixture does not take the tint which we desire to find in this colour; thus we see that it is not easy to ascertain their respective quantities; and still more, as the greater or less degrees of oxidation also change them; it necessarily happens that this circumstance has, therefore, a great influence on the results. That the three primitive colours are found in the three oxides above mentioned, the following is a proof:

The blue from cobalt is essentially a primitive colour, that is to say, that it does not owe its origin to any other colour, and, by consequence, is indecomposable; but it is capable, when mixed with another primitive colour, of forming an infinity of tints, of which all other colours are composed. Thus, for example, the oxide of manganese, whose colour, when well developed, is a violet, more or less intense, as is seen in those vitrifications of which this oxide forms a constituent part, is composed of blue and red, two primitive colours. The oxide of copper, which always affords a green colour when it is used in vitrifications, and the fire has not been too violent, may be considered as formed of blue and yellow. We have thus shown that it is the primitive colours united which form black; yet, nevertheless, when we would mix these three colours directly, we do not always obtain the expected result. What is the cause of this particularity? This question has never been answered, and we shall abstain from entering into any explanation thereof.

Having already given the methods of procuring the oxides of iron, copper, chrome, &c., we shall also show the mode of extracting that of manganese.

We take the mineral known in commerce by the name of manganese stone, and which is composed of kidney shaped black and dull masses. Sometimes, also, the black colour varies to a violet; but we give the preference to that manganese stone which is the blackest, and especially as it is always the purest, and heaviest, which shows that it contains the largest quantity of the oxide of manganese. We pulverize this stone, and calcine the powder until it has acquired the property of strongly tinging the fingers, when it is rubbed between them; which shows that the molecules of oxide are sufficiently disintegrated to produce their intended effects; in consequence, we remove the calcined powder from the fire.

We may remark in passing, that this powder will be considerably diminished in weight, owing to the volatile parts which it contained being dissipated during the calcination. As it sometimes happens that the powdered manganese becomes agglutinated by the action of the fire upon it, it must then be powdered anew, passed through a silken sieve, and enclosed in a box.

The black is composed of one part of each of the oxides of manganese, cobalt, and copper, mixed together.

If the black be a little greenish, the quantity of oxide of copper must be diminished; if too blue, then we must act in the same manner with regard to the oxide of cobalt.

Of the chatiron.—The *chatiron* is simply a colour, composed like the black enamels; the difference consisting in the flux being used in a smaller proportion, as it is destined to represent the knots, the sides, and all those parts which appear a little notched or cut, in the leaves of trees and flowers; so that if the flux predominate too much, those traits would become confounded in the fusion of the enamel, and would not produce their proper effect. This colour is generally employed above or underneath green. It may be composed as follows: oxide of manganese, one part; oxide of cobalt, half a part; and oxide of copper, one part.

M. Brongniart has inserted a memoir on the art of enamelling, in *t. IX. des Annales de Chimie;* in which, after defining the nature of the art of the enameller, he adds as follows. "Notwithstanding all the researches of chemists, on the coloration of enamel, yet this part of the art still remains the most difficult, on account of the inability to find new, brilliant, and agreeable colours. But when the enameller begins to discover some new colours by the mixture of different oxides, and knows the manner of rendering his enamel sufficiently hard, and of giving it a fusibility suitable to melt upon the metal, which is to form the basis of the enamelling; and when he can give to his enamel the finest transparency, and the most perfect homogeneousness, he will have nearly become master of the secrets of his manipulations, and likewise of the theories which conduce to these several ends."

"There are two classes of enamel colours, namely, the opaque and the transparent ones.

"The material common to all species of enamels, is a glass, perfectly transparent, and possessed of a sufficient degree of fusibility.

This is the material which the enamellers term *couverte;* and they introduce into it different metallic oxides, as the glass is to be variously coloured, and thus form the following enamel colours.

"The oxide of tin, used in sufficient quantity, will entirely destroy the transparency, and give the enamel a very fine white colour; and especially if we take care, according to the advice of Kunckel, to add a small quantity of the oxide of manganese to it, which, by parting with some of its oxygen during the fusion, burns those inflammable matters which might alter the whiteness of the enamel.

"If, however, we add but a little oxide of tin to a transparent glass, although its transparency is lost in part, yet we shall obtain an enamel which imitates the reflexion of the opal.

"The yellow enamel is formed with the oxides of lead and antimony. Silver, however, also affords a fine yellow, according to Kunckel.

"The red enamel is produced by the oxide of gold, as well as by that of iron; but that produced from gold is the finest; it is also fixed in the fire, whereas that produced from iron is liable to change.

"The oxide of manganese affords a violet enamel.

"The oxide of copper produces a green enamel; and so also does the oxide of chrome, and the colour is more fixed.

"The blue enamel is coloured by cobalt.

"And, lastly, the oxide of iron affords a fine black.

"The mixture of these different enamels in various proportions, produces an enormous quantity of intermediate colours.

"And thus, in making these colours, by mixing one enamel with another, we also mingle the oxides which were previously united with the glass."

After this preliminary information, M. Brongniart proceeds to describe the application of enamel upon those metals which the enameller is commonly in the habit of employing. These are, gold, silver, and copper.

In respect to gold, he says, "that which is twenty-four carats fine, produces an enamel of any required tint, and of a most agreeable appearance; an effect much finer than can be produced upon gold less fine; firstly, because, as it contains no other metal, so it preserves its brilliancy in the fire. And, secondly, because it is less fusible than alloyed gold, and may be employed with enamel more difficult to melt, and, consequently, harder and more brilliant." He also adds, that although articles of jewelry are seldom made of pure gold, yet they are, nevertheless, capable of being enamelled, provided we do not employ gold which is less than eighteen carats fine, in order that the enamel may be hard and beautiful. The enameller ought strictly to see that his gold is not of too low a quality, as the glass which forms the basis of the enamel must then always contain alkali, to render it more fusible; and which will cause it to lose its brilliancy and hardness.

Leaving these exceptions, M. Brongniart supposes a case, indeed one of the most simple in the art of enamelling; and that it is re-

quired to enamel gold of twenty-two carats fine, of a transparent blue colour.

"The artist," says he, "commences by breaking up his enamel in a steel mortar, and finishes, by grinding it in an agate one, taking care to add water, to hinder the bits of enamel from flying out of the mortar. The point at which he should stop, in the trituration, cannot be indicated, experience can only guide him therein, as certain enamels require to be reduced into exceedingly fine particles, whilst others should remain in a coarse powder. When he thinks that the enamel is sufficiently ground, he washes it, that is to say, he agitates it in clear water, and throws aside the muddy portion, which floats above the enamel precipitated at the bottom of the vessel; he continues this operation until he has thus removed all the improper powder which he finds in the enamel, and until the water in which he agitates it becomes clear, when he leaves it at rest.

"The enamel being thus washed, the artist puts it into a cup of white porcelain, with a thin layer of water above it. He then takes up the enamel with a steel spatula, and extends it upon the gold as equally as possible. As it is a transparent enamel of which we are now speaking, so we generally give to the gold a bright wavy surface, in order to afford a more brilliant reflexion through the enamel.

"The thickness of this first layer depends entirely upon the colour of the enamel. The tender colours generally require to be spread in a thinner layer.

"The enamel being laid wet upon the gold; in order to dry it, we apply upon it a fine linen cloth, which is beginning to get old. We must place this cloth perpendicularly upon the enamel, and withdraw it in the same manner.

"These operations being performed, they prepare to light the fire in the enamelling furnace; if the plate is to be enamelled on both sides, they support it upon a ring of sheet iron, so that the edges, which are not covered with enamel, may only come into contact with the ring. But if it be enamelled on one side only, it may be placed either on a sheet of iron, or a plate of crucible ware. We must also pay attention to these two particulars: firstly, if the subject is but of a small size, and not capable of being enamelled on both sides of it, we must take care that the sheet iron be perfectly flat, in order that when the subject becomes softened by the heat, it may not be warped. And, secondly, if, on the contrary, the subject be of a considerable size, and also counter enamelled, if it be possible; that is to say, that enamel can be applied upon its other surface also; that will have the power of counterbalancing the effect of the first coat in cooling, but whilst the metal is still softened by the heat. The subject then being prepared in any of these ways it is carried to the vitrifying furnace.

"When the fire is lighted, and the furnace has become red hot to the necessary degree, they dispose the pieces of burning charcoal upon the bottom of the furnace, in such a manner that they cannot fall upon the subject to be enamelled, which they place there with the greatest caution. If it be supported either upon a plate of iron,

or of clay, the artist takes hold of it with long slender spring-tongs, which are termed *relève moustaches.* He then places the subject as near as possible to the further end of the furnace, and when he perceives that the enamel begins to melt, he turns the piece round with great delicacy and agility, in order that the fusion may be rendered uniform all over it. When, from the brilliant appearance of the piece, he sees that the fusion is complete, he quickly withdraws it from the fire. This is the most dangerous moment; as, if they exceed the proper degree of fusion of the enamel, either upon gold or silver, they are sometimes obliged to repeat the process a second time, which occasions a considerable loss.

"The piece being cooled, it must receive a second coat of enamel, applied with great care, in the same manner as before; and it must again be passed through the fire with the same precautions."

M. Brongniart next proceeds to describe those manipulations, the object of which is to remove the inequalities produced upon the surface of the enamel. This is done, he says, with a smooth English file, and water. When the file begins to wear, they add some sand. They must employ great care and skill, on the one part, to prevent the enamel from flying off; and, on the other, not to make the enamel too thin in places, which would deprive it of the uniform tint it should possess.

"The polishing of the enamelled parts is effected by means of a powder termed *terre pourrie* (tripoli,) which is a ferruginous clay, very fine, and of but little consistence; but, before using it, it must be washed over, in order to remove the siliceous parts which it contains. In order to effect this operation, it must be put into a mortar, and be ground up with about thirty times its weight of water, and the muddy part which floats must be decanted off into a proper vessel for use. In this manner the grosser and heavier parts will be left at the bottom of the mortar.

"It requires much practice and skill to polish enamel, without causing it to scale off, or to scratch it. They employ a small flat bar of tin, near the end of which they apply a little of the finely washed tripoli, and apply it to the enamel with address, and in a delicate manner; they rub the enamelled piece lightly and uniformly all over, and without removing the enamel any where. Before finishing, they give the last operation, by substituting a piece of wood, from the linden tree, in place of the bar of tin, and upon which they apply the tripoli; and they thus give the enamel that lustre and great brilliancy which it is so important it should possess."

After having thus given an example of one of the most simple cases of enamelling, M. Brongniart finally enters into other details respecting the enamelling upon gold.

"The blue transparent enamel, which we have chosen as an example of the general method of laying on enamel, is not, however, applied in exactly the same manner as others, as some colours demand much greater care in firing them. The opaque colours are those which require the least care.

"There are such a variety of transparent colours, that it is im-

possible to indicate them all; and we shall, therefore, only speak of the principal ones.

"In fact, each transparent colour requires a different gold; that is to say, gold alloyed in a different proportion; thus blue requires us to use a certain gold, whilst yellow, red, green, &c. demand gold of various other colours, it serving as the base or foundation of the enamels.

"To the changes of colour effected by these alloys of gold, we must also add those caused by the fire. These changes are most singular, and especially upon the transparent colours.

"The opaque colours are less susceptible of becoming changed; nevertheless, some of them lose by the stroke of a fire, more or less violent, their primitive colours. The opaque colour, termed *turquoise*, for instance, is subject to become sometimes black, and at other times blue, from the action of the fire. In general, the fire either scales the enamels, or renders them sandy.

"When we would enamel upon silver, we must lay it on in the same manner as upon gold; but there is a difference both in the choice of the enamels, and in the mode of firing them; and we must observe that this difference is so great, that the enamels intended to be used upon silver, must be made expressly for that purpose. The changes which the enamels upon gold experience from the action of the fire upon them, are nothing in comparison with those which we remark in enamelling upon silver.

In order to prove this, the author took a plate of gold, of twenty-two carats fine, and another plate of exceedingly pure silver, whose colour underwent no change from the action of a high degree of heat. He divided each of these two plates into eight slips transversely, and upon each kind he distributed the principal opaque and transparent enamel colours. He remarked the following effects produced upon these colours, after having supported three firings.

"The opaque white enamel remained perfect upon the gold, without alteration. But upon silver it took, at the first firing, an olive tint, semi-transparent at the edges. At the last firing, which was violent, it became nearly transparent, and he perceived waves to extend through it.

"The transparent yellow enamel underwent no change upon this gold; but it did not produce so fine an effect if the metal was alloyed in other proportions. Upon silver it underwent singular changes, which were unaccountable. It acquired, at the first firing, an opalline orange colour; and the last fire changed it to an opaque olive green.

"The opaque yellow enamel underwent no change upon the gold, but as its colour was not proper, so it became paler. Upon the silver it became of a brown colour, and had an opalline semi-transparency.

"The transparent green enamel is one of the most delicate colours, and it would have required a differently alloyed gold to have succeeded well. Nevertheless its colour was not changed upon this metal, only it was not brilliant. Upon silver it became changed

from the first firing, as its edges were of an opaque yellow tint; but, upon the last violent firing, it lost its transparency a little. This degree of fire, however, renders nearly all other colours obscure upon silver.

"The transparent violet enamel undergoes most singular changes both upon gold and silver, and, although it was the same enamel, yet its colour was entirely different upon the two metals. Upon gold it became, at the first firing, of a transparent orange red colour; but, at the last, it acquired an opaque lilac colour. Upon silver it took at first an opaque lilac colour, and, finally, became a foul opaque brown.

"The blue enamel, of all the colours, is that which is the finest, and constantly remains the same, although the gold it is applied upon is exposed to the most violent fire. But, upon silver, it is the most changeable of all the enamels. It acquires, on the first firing, a blackish hue. But the last and strongest fire again restores its fine blue colour.

"Lastly, the black enamel is, of all colours, the most easily applied; it, indeed, assumes, upon silver, a violet tint on the first firing; but the last firing restores its colour again. It may be here remarked, that this last stroke of the fire, and which effects the changes in the enamels, must be powerful enough to fuse part of the silver.

"As to enamelling upon copper, this metal is but little used by the enamellers, on account of the difficulties which are experienced in employing the fine colours upon it; the transparent ones becoming nearly black. The opaque ones are those which can be most conveniently employed. But it must be observed that their edges almost constantly acquire a greenish tint. When the layer of enamel is too thin, or the fire is too violent, the enamels generally become black.

"We may, nevertheless, give copper a coat of transparent blue enamel; but, in order to preserve its colour, we must lay beneath it a bed of opaque white enamel; in this manner the blue may be kept apart from the copper.

"With regard to the theory of the art of enamelling, it is easy to understand it in certain cases; but others, again, present the greatest difficulties. In order that a metal should be proper for the purposes of the enameller, it is necessary that it should fulfil two conditions. First, it must be less fusible than the enamel, from whence it results that lead, tin, and bismuth, must be excluded, these metals being improper, from their great fusibility, to undergo the operation of enamelling; and, secondly, that the metal to be enamelled, should not be too readily oxidable in the fire, as this oxide, when dissolved in the enamel, changes the colour of this substance.

"The theory of the changes in enamel colours is more difficult to understand. We can, indeed, easily conceive that when the enamel upon silver assumes an opaque olive colour, it must be attributed to the oxide of silver dissolved in the enamel; and we may also conceive that when the fire is more violent, it augments the force of

this solution, changing the affinities, as well as the proportions of the mixtures, and thus it may easily change the same enamel to different colours. But it is difficult to understand how the silver becomes a little oxided by simply heating it, and that to a degree which is not sufficient to fuse it, and more especially when it is defended by a coat of glass from the contact of the air. It is of little use to say that we have removed the oxygen from the metallic oxides in the enamels, silver being one of the metals which has the least affinity with that substance. Finally, it is not easy to explain why a transparent enamel becomes opaque by the action of a too violent fire, and which also renders transparent an opaque enamel; and thus it becomes absolutely necessary to use different enamels upon gold and silver."

Important Experiments on Steam Boilers.

[From the Edinburgh New Philosophical Journal.]

We have received the following account of the experiments made with the new *Marine boiler* on Messrs. Braithwaite and Ericsson's construction. It is a low pressure boiler; and, from these experiments, it is evident that the following important advantages will arise to steam navigation by the introduction of this principle: 1. The total absence of all smoke; 2. The dispensing with the chimney; 3. A saving of at least 120 per cent. in the cost of fuel, and 30 per cent. in the space to stow it; 4. A saving of about 400 per cent. in the space occupied by the boilers. The same principle is now applying, by Messrs. Braithwaite and Ericsson, to the new locomotive engines constructing for the Liverpool and Manchester rail-way, which are to be delivered at mid-summer; and a similar combination of vast power, in a small space, with a great saving of fuel, will be applied to them.

Memoranda relative to the experiments made at Mr. Laird's works at North Birkenhead, with the new Low Pressure Boiler, on the exhausting principle of Messrs. Braithwaite and Ericsson, by Alexander Nimmo, Civil Engineer, Dublin, and Charles B. Vignoles, Civil Engineer, London.

The exhausting apparatus consisted of a fan-wheel, with broad radial leaves, revolving within a close box or chamber, placed a little apart from the boiler, but connected with it by a passage leading from the flues traversing the boiler: a short tube above the exhausting chamber passed out to the atmosphere. The furnace was attached to and placed at the end of the boiler, opposite to the exhausting apparatus, which latter being put to work, drew through all the turns of the boiler the hot air from the fire, which passed over the throat of the furnace through the bridge flue, and then successively through the other five turns of the flue arranged through the boiler, and finally was drawn through the exhausting chamber and passed into the atmosphere. The heat, which in the furnace was extremely intense, was absorbed by the water in the boiler as the air rushed

through the flues, and, when passing up the tube or funnel from the exhausting chamber, was so far cooled that the hand or arm might be placed with impunity down the tube, the temperature probably not exceeding 180° of Fahrenheit. Not the slightest smoke was perceptible. The following are the principal dimensions measured:

	Ft. In.		Ft. In.	
Furnace	2 0 deep 2 6 long 2 6 wide	Ash Pit	1 0 deep 2 6 long 2 6 wide	The openings of the fire are equal to about half the area of the bottom.

	Ft. In.		Ft. In.	
Exhausting Chamber	2 6 high 3 6 wide 3 6 long	Outside Dimensions	Diameter of Exhausting Wheel, - -	3 0
			Breadth of the same,	0 10

Bridge flue or throat from the furnace, 2 feet 6 inches broad, 4 inches wide, 2 feet deep, 5-16th inch iron plate.

First turn of the flue 4 inches wide, 2 feet deep; 2nd, 3d, 4th, and 5th turns, 3 inches wide, 2 feet deep. } ¼th inch iron plates.

Whole length of the flues through the boiler, 45 feet.

Superficial area of the heating surface, 247 square feet.

The contents of the water in the boiler when filled were from - - - - - - 85 to 90 cubic feet.

The superficial area of the evaporating surface in the boiler, - - - - - - - 33 square feet.

The proportion of the heating to the evaporating surface nearly 7½ to 1.

	Ft. In.		
Steam Chamber	3 0 wide 4 10 average depth 4 6 long	}	containing about 65 cubic feet.

Diameter of the safety valve very nearly 5 inches, being 19 square inch area, which was loaded for a pressure on the square inch of 4 lb. giving 76 for the load.

Of this, 66 lb. of iron were placed in the boiler, and 10 lb. allowed as the weight of the valve, rod, hook, handle, &c. The water used was the salt water from Wallasey Pool, and filled into a large iron tank, the area of the surface of which measured 32½ superficial feet. The boiler was placed under an open shed; the day was very cold, with thick rain. No engine being attached to the boiler, the exhausting apparatus was worked by a wheel and band from Mr. Laird's turning engine. The velocity of the circle of percussion of the leaves of the exhausting wheel was determined to be about 77 feet per second, or upwards of 52 miles an hour. Mr. Laird's engine is stated to be a four horse power. No determinate measurement was made, but the engineers present computed that the power applied to turn the exhausting wheel was equal to that of two horses. The fire being lighted, the steam was got up to 4 lb. pressure in 45 minutes, with a consumption of 2¼ cwt. of coke. The expenditure at first was 8 lb. per minute, and gradually decreased to 5 lb. averaging about 6¼ lb. per minute for getting up the steam. The steam began to rise in 27 minutes, after which the consumption of coke was little

more than 5 lb. per minute; and at this period there would have been a sufficient supply of steam to work the cylinders of an engine. The coke employed was gas coke of very bad quality, of which 53 cubic feet weighed 1065 lb., giving 50 lb. for the weight of a cubic foot, or 3000 lb. as the weight of 100 cubic feet. The same weight of St. Helen's coal (that principally used in steam boats) measures 63 cubic feet. The cost of the coke used was 8s. 6d. per ton, delivered in Liverpool; the cost of smithy coke being 25s. per ton, of which 5¼ cubic feet weighs 115 lb., giving very nearly 38 lb. for the weight of a cubic foot. When the steam was up, the water in the thick glass gauge attached to the boiler standing at 7½ inches, the two men stationed for the purpose began to pump, a fresh supply of weighed fuel was placed on the floor, and the following observations were made:—at 3h. 32m. began to pump; at 3h. 56m. 16 cubic feet of water were evaporated; at 4h. 13m. 27 cubic feet of water were evaporated; at 4h. 19m. 38 cubic feet of water were evaporated, and 2 cwt. of coke consumed; at 4h. 32m. 49½ cubic feet of water were evaporated, with a consumption of 262 lb. coke. From which it appears, that only 6 lb. of coke per cubic foot of water per hour was consumed; and the evaporation of a cubic foot of water per hour being generally considered the measure of a horse power, the conclusion is, that the boiler was a forty horse boiler, and that the quantity of fuel requisite to work it is 2½ cwt. per hour, the expense of which is 12½d.; and as the consumption diminishes after the first hour, the expense of fuel will probably not exceed 1s. per hour for the forty horse boiler.

Signed, Alexander Nasmyth, C. E.
Charles B. Vignoles, C. E.

On Improvements in the Microscope. *By* Edward Thomas, late assistant engineer on the Cayuga and Seneca Canal.

The *Achromatic* Microscope is superior to all other kinds where great power is necessary. It was "first constructed [in Europe] at the suggestion and expense of Dr. Goring, by Mr. W. Tully, in the summer of 1824."* This kind has more recently been constructed in this country by my friend Allen Allen, of Boston, (who has executed them with great skill,) and by myself. I have constructed them of the double, treble, quadruple, quintuple, and sextuple forms, the two last of which are the best, when the achromatic lens is designed for the object-glass of a compound microscope.

A quintuple object-glass of mine, which is represented in section by Fig. 1, consists of two concave flint lenses and three convex lenses of plate glass. The lenses of flint-glass are represented in the figure by the dark, and the plate lenses by the white spaces. O being the place of the object. The surfaces in contact are cemented with

* See "Library of Useful Knowledge," No. 21, page 46.

through the flues, and, when passing up the tube or funnel from the exhausting chamber, was so far cooled that the hand or arm might be placed with impunity down the tube, the temperature probably not exceeding 180° of Fahrenheit. Not the slightest smoke was perceptible. The following are the principal dimensions measured:

	Ft. In.		Ft. In.	
Furnace	2 0 deep 2 6 long 2 6 wide	Ash Pit	1 0 deep 2 6 long 2 6 wide	The openings of the fire are equal to about half the area of the bottom.

	Ft. In.		Ft. In.
Exhausting Chamber	2 6 high 3 6 wide 3 6 long	Outside Dimensions	Diameter of Exhausting Wheel, - - 3 0 Breadth of the same, 0 10

Bridge flue or throat from the furnace, 2 feet 6 inches broad, 4 inches wide, 2 feet deep, 5-16th inch iron plate.

First turn of the flue 4 inches wide, 2 feet deep; 2nd, 3d, 4th, and 5th turns, 3 inches wide, 2 feet deep. } ¼th inch iron plates.

Whole length of the flues through the boiler, 45 feet.

Superficial area of the heating surface, 247 square feet.

The contents of the water in the boiler when filled were from - - - - - 85 to 90 cubic feet.

The superficial area of the evaporating surface in the boiler, - - - - - - - 33 square feet.

The proportion of the heating to the evaporating surface nearly 7½ to 1.

	Ft. In.		
Steam Chamber	3 0 wide 4 10 average depth 4 6 long	}	containing about 65 cubic feet.

Diameter of the safety valve very nearly 5 inches, being 19 square inch area, which was loaded for a pressure on the square inch of 4 lb. giving 76 for the load.

Of this, 66 lb. of iron were placed in the boiler, and 10 lb. allowed as the weight of the valve, rod, hook, handle, &c. The water used was the salt water from Wallasey Pool, and filled into a large iron tank, the area of the surface of which measured 32½ superficial feet. The boiler was placed under an open shed; the day was very cold, with thick rain. No engine being attached to the boiler, the exhausting apparatus was worked by a wheel and band from Mr. Laird's turning engine. The velocity of the circle of percussion of the leaves of the exhausting wheel was determined to be about 77 feet per second, or upwards of 52 miles an hour. Mr. Laird's engine is stated to be a four horse power. No determinate measurement was made, but the engineers present computed that the power applied to turn the exhausting wheel was equal to that of two horses. The fire being lighted, the steam was got up to 4 lb. pressure in 45 minutes, with a consumption of 2½ cwt. of coke. The expenditure at first was 8 lb. per minute, and gradually decreased to 5 lb. averaging about 6¼ lb. per minute for getting up the steam. The steam began to rise in 27 minutes, after which the consumption of coke was little

more than 5 lb. per minute; and at this period there would have been a sufficient supply of steam to work the cylinders of an engine. The coke employed was gas coke of very bad quality, of which 3¼ cubic feet weighed 105 lb., giving 30 lb. for the weight of a cubic foot, or 3000 lb. as the weight of 100 cubic feet. The same weight of St. Helen's coal (that principally used in steam boats) measures 63 cubic feet. The cost of the coke used was 8s. 6d. per ton, delivered in Liverpool; the cost of smithy coke being 25s. per ton, of which 3¼ cubic feet weighs 115 lb., giving very nearly 33 lb. for the weight of a cubic foot. When the steam was up, the water in the thick glass gauge attached to the boiler standing at 7½ inches, the two men stationed for the purpose began to pump, a fresh supply of weighed fuel was placed on the floor, and the following observations were made:—at 3h. 32m. began to pump; at 3. 54m. 16 cubic feet of water were evaporated; at 4h. 12m. 27 cubic feet of water were evaporated; at 4h. 19m. 38 cubic feet of water were evaporated, and 2 cwt. of coke consumed; at 4h. 32m. 41¼ cubic feet of water were evaporated, with a consumption of 252 lb. coke. From which it appears, that only 6 lb. of coke per cubic foot of water per hour was consumed; and the evaporation of a cubic foot of water per hour being generally considered the measure of a horse power, the conclusion is, that the boiler was a forty horse boiler, and that the quantity of fuel requisite to work it is 2¼ cwt. per hour, the expense of which is 12⅔d.; and as the consumption diminishes after the first hour, the expense of fuel will probably not exceed 1s. per hour for the forty horse boiler.

Signed, ALEXANDER NIMMO, C. E.
CHARLES B. VIGNOLES, C. E.

On improvements in the Microscope. *By* EDWARD THOMAS, late assistant engineer on the Cayuga and Seneca Canal.

THE *Achromatic* Microscope is superior to all other kinds where great power is necessary. It was "first constructed [in Europe] at the suggestion and expense of Dr. Goring, by Mr. W. Tully, in the summer of 1824."* This kind has more recently been constructed in this country by my friend Alden Allen, of Boston, (who has executed them with great skill,) and by myself. I have constructed them of the double, treble, quadruple, quintuple, and sextuple forms, the two last of which are the best, when the achromatic lens is designed for the object-glass of a compound microscope.

A quintuple object-glass of mine, which is represented in section by Fig. 1, consists of two concave flint lenses and three convex lenses of plate glass. The lenses of flint glass are represented in the figure by the dark, and the plate lenses by the white spaces, O being the place of the object. The surfaces in contact are cemented with

* See "Library of Useful Knowledge," No. 21, page 46.

Canada balsam, so that the compound lens has only four *reflecting* surfaces, and in consequence the vision is much clearer. The quintuple object-glass has a larger field of distinct vision than any other *achromatic* combination that I have seen.

I have a sextuple object-glass, Fig. 2, shown in section of twice its real size, that consists of two double concave flint lenses, and four convex lenses of plate glass. Its dimensions and radii are as follows; *a* stands at the first surface, *b* at the last, and O represents the place of the object to be viewed.

		Inch.	
Radius of	1st. surface,	0.44	plate.
do.	2d. do.	0.26	plate.
do.	3d. do.	0.26	flint.
do.	4th. do.	0.44	flint.
do.	5th. do.	0.44	plate.
do.	6th. do.	0.70	plate.
do.	7th. do.	0.174	plate.
do.	8th. do.	0.26	plate.
do.	9th. do.	0.26	flint.
do.	10th. do.	0.44	flint.
do.	11th. do.	0.44	plate.
do.	12th. do.	plane.	plate.

Fig. 1.

O

Fig. 2.

O

Focus of compound lens, 0.25 of an inch.
Total diameter, 0.25 do.
Clear aperture, 0.20 do.
Specific gravity of flint glass = 3.457.

The sextuple object-glass bears a larger aperture, in proportion to its focal distance, than any other that I have used; and the field of distinct vision is greater than it is in any other achromatic combination that I have examined, except the quintuple lens. It is cemented so as to have only four reflecting surfaces. Upon the whole I consider it as the best combination known at present.

The focal distance of the compound lens, Fig. 2, is one-fourth of an inch; but when the lens is used as the object-glass of a compound microscope, which magnifies two hundred or three hundred times the diameter, it will show as minute an object as can be seen with a good *single* lens of mine that has a focal distance of 0.014 of an inch, and which magnifies the diameter five hundred times.

After numerous experiments, I am satisfied, that the principal defect in the achromatic microscope, is not the colour of the secondary spectrum, as appears to have been generally supposed, but that it is what may be called the *Secondary Aberration of Figure:* which is occasioned by the spherical aberration increasing in a greater ratio, from the centre of the concave, than it does in the convex lenses. When the spherical aberration of the convex lenses equals the aberration of the concave ones, with a given aperture, I have found from experiment, that if the aperture be diminished, the aberration of the convex will be too *great* for that of the concave; and that if the aperture be enlarged, the aberration of the convex will be too *small* to counteract that of the concave lens or lenses. Were it not for this

property, which exists in all the achromatic combinations that I have examined, so many lenses as we are now obliged to use for one object-glass, (in order to have a good one,) would not be necessary. The secondary aberration of figure is not a sensible defect in object-glasses for long achromatic telescopes, though I am induced to believe that it will materially affect very short ones. This aberration might be corrected by making all the surfaces spherical except one, which should be formed by the revolution of an ellipse on its conjugate diameter, when the elliptic surface is convex. But as this is impracticable, there is no way yet known of entirely destroying the secondary aberration. It was, however, much reduced in the sextuple lens above mentioned, by making one of the uncemented surfaces as nearly elliptic as was practicable.

The achromatic microscope might be much improved, if some new arrangement of lenses, with spherical surfaces, could be devised, that would entirely destroy the secondary aberration of figure. Of this defect the sextuple lens has less than any other combination consisting of a smaller number of single lenses; because the radii of the flint lenses are greater, when the focal distance of the compound lens is the same.

I find by experiment that a more minute object can be seen in blue or purple light than in any other, provided the microscope is sufficiently powerful. This probably arises from the *rays of light having a greater magnitude*, at the red, than at the purple or violet extremity of the spectrum.*

It is not known that purple light has ever been used before for the purpose of increasing the real power of a microscope: indeed it appears to be of no sensible advantage, unless the compound lens will show a more minute object than can be seen with *any single lens*. One of my sextuple object-glasses has a focal distance of 0.07 of an inch; when this is used there is an advantage in the application of purple light, and it is believed that this combination will exhibit a smaller object than any other optical instrument hitherto made.

The superiority of this microscope over those constructed in Europe (as before mentioned,) consists, first, in its having less secondary aberration of figure; second, in having fewer reflecting surfaces; third, in having a shorter focal distance; and fourth, in the application of purple light.

A much simpler combination than the above was suggested, for destroying all the spherical aberration, by J. F. Herschel, Esq. consisting of a double convex lens with radii as one to six, placed in contact with a meniscus. It was believed that this combination would be nearly free from the errors of colour, when purple light was used, and quite free from spherical aberration. But after investigating it both practically and theoretically, I found with regret, that when the thickness of the lenses was such as is necessary to have in an object-glass of high power, that the marginal rays, (al-

* See "Library of Useful Knowledge," No. 12, p. 32; where the limit of microscopic vision, depending on the magnitude of the rays of light, is treated of by Fraunhofer.

though the aberration of figure was much reduced,) had a shorter focus than the central rays. This combination might probably be improved, when its aperture is large, by adding a plano-concave lens of the same kind of which the other two lenses are made, having its concave side towards the parallel rays, and by changing the curves of the meniscus so as to destroy the aberration of figure.

A very simple microscope, mentioned in the American Journal of Science and Arts, Vol. 17, p. 362, was proposed by Dr. Wollaston, consisting of two plano-convex lenses with their plane sides next the object, and placed at such a distance from each other as would best correct the colour. (See p. 56, of this volume.) Though this microscope has advantages, I am satisfied from experiments that the sextuple object-glass is decidedly superior.

Purple light may be obtained by causing the sun's rays to be refracted through the prism, which will sufficiently separate the colours when it is placed ten or twelve feet from the microscope. It is probable that purple light would be preferable to any other, if it could be obtained sufficiently strong; but from experiment it appears that blue light answers the purpose as well, on account of its greater intensity.

In viewing most objects with blue or purple light, it is necessary to cause the light to pass through a surface of ground glass, which should be placed one or two tenths of an inch further from the object-glass of the microscope than the object viewed.

[*Silliman's Journal.*

On the Safety of Steam Boats. By Professor Silliman.

The painful interest connected with this subject continues to receive occasional augmentation from the recurrence of fatal accidents. We refer our readers to some remarks in the beginning of the first article of the present number, and although they were written several months since, they are (if correct and judicious) more seasonable now than ever. The late fatal catastrophe on board the United States, steam boat of New Haven, is in some respects more interesting to the community than any one that has preceded it. This increased importance grows out of the fact that we are here deprived of the usual extenuations by which we hope to persuade ourselves that the accidents are fortuitous, and that they may not occur again. On board the United States there was a full supply of water, and the flue was not unduly heated; there was no improper pressure, and less than had been usually employed; the part of the boiler that failed was new; the commander was a veteran, distinguished for his experience, skill and vigilance, and his people were sober and faithful; still an explosion occurred which destroyed one-sixth of all the persons on board; we cannot, therefore, enjoy the consolation of imputing blame, and must charge the catastrophe to causes that may and will produce the same effect again.

In other cases we hear, indeed, that in one instance, the water was

deficient, and the flue became red hot; in a second, that the safety valve was obstructed or overloaded; in a third, that the supply tube was choked; in a fourth, that the boiler was old, and had become weak; in a fifth, that the metal, although new, was flawy; in a sixth, that they were in a strife for speed, and carried too much steam; and in a seventh, that the engineer was ignorant or intemperate, and the commander unqualified or remiss.

All these causes and others, have, doubtless, in different cases, contributed to produce explosions; but still the painful conclusion is forced upon us, that *explosions of steam boilers are produced by the energy of the power and by the weakness of the materials.* Our efforts must, therefore, be directed to the controlling and regulating of the power, and to the best use of the copper and iron, of one or the other of which the boilers are always made, and to their most judicious size, form, construction and position. This subject has recently attracted the attention of the Franklin Institute in Philadelphia, and that very useful and patriotic body has published a judicious circular, calling for exact information as to the facts that may tend to illustrate the causes and to indicate the remedies for explosions by steam. They direct their inquiries particularly to

The Boiler.—Its size, form, and relative thickness, the material from which it is made, (of copper or iron, &c.) if of iron, whether of foreign or American iron, especially in the boiler that exploded.

Safety Valve.—Its form, size, load in proportion to the thickness of the boiler, liability to get out of order, facility of repair, number used, location of the valve.

Supply of Water.—Mode of insuring a sufficiency, how gauged?

Arrangement of the Boilers in the Boat; which is less liable to accident?

Construction of the Boat—to avoid accidents in the boilers.

The very respectable names attached to the circular give us the best pledge, that a valuable report will, hereafter, be given to the public.

In the mean time, however, other explosions will occur, and other victims will be added to the great number already immolated by these thunder strokes of a power which so often proves more than a match for human skill. There is every possible motive for increased effort in improving the means of producing, managing and controlling steam; and with no view to diminish, but rather to quicken those efforts, we urge, that certainly for the present, and perhaps for ever, the safety of the community must depend upon one of two arrangements.

1. Having two boilers placed on the guards of the vessel over the water, and separated from the passengers, not only on the side,* *but every where*, excepting at the mouth of the furnace, by a bulwark made of timber, and sufficiently strong to resist, not only water and steam, but also the fragments that may be projected, or even the entire boiler should it be thrown from its bed.

* Open of course towards the water.

2. By taking a passage vessel in tow, the power being generated in one vessel, and the passengers being in another.

The first arrangement would be particularly important in such waters as are occasionally rough, where towing might be inconvenient, and at times impracticable, as on Long Island Sound, and the Chesapeake and the great lakes. To the second there seems no objection of any weight, upon waters protected from storms, and which are generally smooth; such as all our rivers and many of our bays, and arms of the sea. The excessive speed which is now aimed at, is of no importance; no reasonable man will be dissatisfied if, (sleeping and waking) he can go ten miles in an hour, which exceeds the rate of the swiftest mails in Europe, and is hardly surpassed by the fastest sailing ships of war. This degree of speed, and probably more, is attainable in tow boats, and we have thought the important suggestions of Mr. Richard Sullivan, an experienced scientific, as well as practical engineer, contained in the subjoined paper, which originally appeared in the Daily Advertiser of New York, worthy of being preserved, as containing an excellent summary view of safety barges, towed by steam boats. With him, we greatly fear that explosions will never be entirely prevented; and while several of them occur every year; while many valuable people are thus torn from life and from their friends, in a manner even more agonizing than by the casualties of war; while general anxiety pervades the community, and we *know that* (like the Parisians of late) *we are reposing over a volcano;* no time should be lost in adopting such means of prevention or of safety, as cannot fail to be in a good degree successful, at least in preserving the lives, now so often sacrificed; and the number of which will be greatly augmented whenever an explosion shall happen among the congregated hundreds, who now, *tempted by a mischievous nominal fare,* crowd the decks of many of our steam boats, so that they resemble transport ships, in a time of war, more than vessels for safety and pleasure, in a period of peace. The double remedy now pointed out is worthy of the more consideration from the proprietors of steam boats, because all those now in use, (with a great addition to their accommodations as well as safety,) can be furnished with the double boilers and the protecting bulwarks, which, to afford every possible security to their people, should be adopted, even where the safety barges are added. Then all the protection will be afforded, which the present state of our experience admits, and it will probably be sufficient, even should science and art do no more for mankind on the subject of steam; explosions will be diminished in number, because the boilers will be smaller, and more anxiously watched, and the victims, few in number, will be those who, like soldiers and sailors in time of war, encounter a known danger, and have a right to, and will obtain, a reward in some measure proportionate to the risk incurred. *The proprietors of steam boats must answer it to their country and to God, if they neglect any practicable means of defending their fellow creatures from the most awful and afflictive casualty to which the confiding traveller is exposed.* No scheme will answer which does not either remove the passengers

from the danger, or remove the dreaded boiler from the crowd which surrounds it, and from the possibility of deluging men, women and children, in boiling water—in boiling brine—in an atmosphere of over heated steam, or of destroying them by the fragments, or by the entire boiler, projected among their crowded ranks. *The boat which is first ascertained to afford absolute security will be a fortune to its proprietors.*

On the Safety of Steam Boats. By JOHN L. SULLIVAN, Civil Engineer.

Theodore Dwight, Esq.—SIR,—Your paper, and others, having given expression to the public solicitude on occasion of the late accident on board the Marshall, in reference to the future safety of passengers, it may be presumed that any suggestions to that end will be acceptable to a community with whom the inquiry may well arise, whether there can be any sure remedy for this danger?

To mention only some of its sources will enable all to answer the question for themselves.

The engineer (commonly so called) is not perhaps the person to whose negligence these calamities are chargeable, but rather to the fireman; who, besides throwing in the fuel, has to see, by the gauge cocks, that the water is kept adequately supplied. This station is extremely arduous, and he is to an unusual degree exposed to the temptation of drinking inordinately. The boiler is usually made of large diameter, and with an inside flue, which is intended to be always covered by the water. This is not the strongest form in which a boiler can be made, but is that which takes up the least room. This flue may, not only from the inattention of the fireman, but from any accidental obstruction or disorder of the supply pump, get uncovered, or the water low, when it will become red hot, soft, flexible, thin, and weak; and as this part of the boiler is out of sight, this may happen (to a degree short of giving way) frequently in the course of a season: and although the proper quantity of water may be presently regained, still the hidden weakness thus caused remains, and may show itself fatally at some subsequent period. If it were asked, how is the thickness of a boiler in all its parts, after being some length of time in use, ascertained to be sufficient? The usual method is to strike it with a hammer, wherever accessible, trusting to the indications given by the sound of the blow. In the making of boilers, it is possible that the plates may have flaws not quite obvious enough for their rejection, and it is not uncommon for rivets to break by the expansion of the metal, if not made of very good iron. Boilers may be kept in use too long, when the business is not very profitable. It is an expensive job to displace them for repairs, and it is natural to defer it as long as may be safe. Steam boats are sometimes sold at auction, to close a concern, when although the age of the boiler may be told, its condition cannot be so easily known.

It is commonly supposed that the safety valve is an effectual safe-

guard; and it is so, in a well made and well managed engine. The intention of it is to allow the steam to vent itself when it gets so strong as to lift the weight hung upon the lever of the valve. But it has been known to be fatally overloaded. Besides it is not calculated to give passage to a great and sudden increase of steam. And such sudden and great increase may happen when the flue has been long enough bare to get red hot, and water is suddenly restored in sufficient quantity to receive its accumulated heat. It is well known that water boils at 212° of Fahrenheit. But it is not so generally known that after this degree of heat, every additional 30 degrees, doubles and redoubles the expansive force of the steam, and that it requires very much less fuel and time to produce this 30 degrees more heat, than to produce the preceding 212°.

As explosions have not been confined to high pressure engines, and as the effects have been so tremendous, it has been supposed that the red hot iron of the flue must sometimes decompose a portion of water into its constituent gases, (hydrogen and oxygen.) But it does not seem to be necessary to resort to this supposition to account for the effects, if we consider the amount of the force suddenly liberated by the disruption of the boiler. It must be equal to the outward pressure on a square inch of the safety valve, perhaps never less than 20 lbs., multiplied by every square inch of the internal surface. The displacement of the boiler with such surprising violence may be accounted for from the recoil or reaction of the force from the first considerable resistance it meets with; as well as by the expansive force in the direction it takes. Thus when the Hoboken boat exploded, I am told the boiler was thrown upwards—the rupture being at the under side. That of the Helen M'Gregor being towards the stern, the boiler went overboard through the bow of the boat. Had the forward end burst, it might have been thrown as far as the cabin. The boat may be so injured as to immediately sink —the force driving some part of the machine through the bottom or side; or the shock may start the planking. In two instances the boat has sunk. The danger of this must be greater when the boilers are below, than when on deck.

Every one will admit that it will be for the interest of owners, masters, and men, to take the utmost care. But the danger is inherent in the nature of the power, and it is greater than that from negligence. One fact alone proves this: that the safety valve has not been a sufficient protection in either of the melancholy instances of explosion that have taken place. What is the inference? It must be that the boiler, though up to that time strong, has some how become too weak to bear an expansive force below what it was intended to contain; or else that somehow that force has become suddenly so great that the safety valve cannot give vent to the steam.

If then there can be no perfect assurance of safety in steam boats, and so far as depends on fidelity and judgment, much confidence must be reposed in individual labourers, there can be no safety but in keeping out of the reach of the explosion, should it happen; but this can hardly be done, if in the same boat. My opinion, long since formed, and the occurrence of so many accidents—the increase of

travel, and the number of steam boats employed, and the circumstance of their growing old, like other machines and vessels, prompt me to remind you of your being, some years ago, on an arbitration between the late Mr. Fulton and myself, to settle the question which of us had first originated the improvement in steam navigation, of separating the load from the power—the passengers from the danger. Had the award been in his favour, this method would probably have been then carried into practice; but being in mine, the exclusive privilege granted by the state to the North River Company, prevented. Yet I have the satisfaction of knowing it had the approbation of that distinguished leader in the art of steam navigation, and I now with pleasure see it in successful use for commercial transportation on the Hudson. But the attempt to carry it into effect for passengers, made with the steam boat Commerce, two years ago, was too feeble; she having no more power than is usual in boats of her class for their own impulsion.

The original design was to appropriate and devote the *leading* boat to the power, and to employ more than is usual for one boat; ample room on board permitting this conveniently, and of using the strongest form of boiler. The *follower* is attached to the leading boat, at a suitable distance, and in a manner that allows of steady motion; and being of a light, sharp construction, with one deck, the resistance of the water and air will be but small; indeed, it is the most favourable plan for great speed. It is yoking the gigantic powers of steam to a floating car, and driving them fearlessly along the liquid plain. There is also economy in this plan of operation. Fuel is the heaviest item of expense. The use of *anthracite coal* in steam engines, is a desirable improvement in their management. Hitherto, the difficulty was in augmenting and diminishing this kind of fire at pleasure, in boats. It required a peculiar form of furnace. I mention it because it will afford a sufficient degree of protection against excessive competition, should the state of public feeling positively require, in future, this perfectly safe conveyance.

It is not probable that the memory of the late accidents will pass away, as others have, with only a transient impression of their horrors. The danger has at length come near. Every boat to and from this city bears the connexions and friends of some of us. Were it simply a question of benevolence, or of some public improvement, it would be carried by acclamation. But there is one difficulty in the way. It is *considered a branch of business*, in which the public has no more concern than in stages. It is left to the enterprising in its line, and all trust that competition will produce perfection, as well as cheapness. And it might be left to ordinary competition, were it not a question of life. It is, in this respect, quite different from all other branches of business. It is a concern belonging to the public, as well as to the owners of the boats, and yet its defects and dangers are not of a nature to be prevented or guarded against by any law. Nothing but a determination of the community to have and sustain safe steam conveyance, will avail.

This branch of enterprise has taken the form of rivalry, in splendour and rapidity, and these admirable qualities will still command

an ample share of business. But, however admirable, they do not compensate for the risk of life. Why should not the public be also entirely satisfied on this point, and have the choice, at least, of safety. This improvement remains to be made, and superadded. Knowing its practicability, and the excellent accommodation of which this method is capable, it seems incumbent, at this time, thus to bring it into view. If its suggestion meets with approbation, a company may, perhaps, be formed, with sufficient capital for two equipments, one to proceed every day from New York to Albany. The passage may in this manner be accomplished, it is thought, in ten hours.

As travel is always increasing between these cities, and as a rational preference would be given to a commodious yotte, (yacht) drawn swiftly and steadily along, there seems to be some reason to expect the concern would be profitable. But the prevailing opinion may be, that it cannot be said to be certainly an object of speculation, or a source of profit. Perhaps the undertaking must rest alone on the basis of philanthropy and public spirit. If, then, on this ground, the prevailing sentiment of the community is favourable, perhaps it will be manifested by an ample capital, subscribed in moderate sums, especially should it meet the approbation of those who assemble daily at the banks and public offices, and to administer the city government. It is a measure of self-defence.

Submitting the subject thus to you, sir, for a place in your paper, I am, very respectfully, your humble servant,

JOHN L. SULLIVAN, Civil Engineer.

Patterson, N. J. 29th April, 1830.

[*Silliman's Journal.*

Strength of Wine and other Bottles.

M. COLLARDEAU has constructed a machine for the purpose of trying the strength of wine bottles. It has been presented to the Académie des Sciences, and reported upon by MM. Hachette and D'Arcet. The bottle to be tried is held at the neck by means of a lever, having three branches, which grasp it below the ring; being then filled with water, it is connected by means of pipes, with a forcing pump, the pipe having a cap furnished with leather, which is firmly held down by the apparatus upon the mouth of the bottle; the pressure upon the parts here increases with the pressure of the water within the bottle. Besides the pump, levers, and connecting pipe, there is also a manometer connected with the interior of the bottle to show the pressure exerted. When a bottle is burst in this way by the hydraulic press, no violent dispersion of its parts takes place, unless, indeed, in place of being *filled* with water, a portion of air is left in; then when it breaks it flies to pieces, and would cause danger if exposed.

Bottles intended for the manufacture of brisk Champagne or Burgundy, being tried, were found to break with a force between 12 and 15 atmospheres, exerted from within, outwards; a few rose to 18 atmospheres. Bottles which had contained Champagne of the

finest quality, broke at the same pressures. Bottles which resisted the pressure of 12 atmospheres, usually broke with one or two atmospheres more, but the number of these was small. The fracture of bottles in the manufacture of brisk Champagne is from 10 to 20 per cent.; and in certain cases, which, however, are rare, almost the whole have been broken. It appears quite certain, that during the fermentation of the wine, the pressure rises above 12 atmospheres, but the full extent can be ascertained only by careful experiments made by the wine proprietors.

The commissioners then remark, that the best bottles intended for brisk wines are too weak; the general fault is want of strength and uniformity in the belly of the bottle, especially at the junctions with the neck and with the bottom.

As the greater number of bottles for brisk wines are of the same quality, it becomes a question why some should break and others not. This difference is supposed to depend upon the form of the neck and quality of the cork, allowing a little gas to escape in some cases, and not in others. If the bottles and corks were all alike, all those which contained the same liquor at the same temperature would probably break at the same pressure. The only means of avoiding fractures is either to make the bottles sufficiently strong, or to allow a little escape of gas by the cork. The least thickness of glass in the belly of the bottle should be 2 millimetre (.079 of an inch,) but generally it is only 1 millimetre at the part next to the bottom.

[*Bull. Univ.*

Remarks by the EDITOR, *on* C. P. SAKMEISTER's *defence of his patent Piano Forte, page* 335.

THE pages of our Journal are open both to attack and defence, when the arms of the combatants are not directed against persons. We had rather give an hour to the correction of an essay written by an unpracticed hand, than a minute to the rounding off the asperities of an angry writer. Should "A Manufacturer" choose to reply to Mr. Sakmeister, we see no benefit to be derived from his giving his own name, although we have no objection to his doing so, provided personalities are avoided; we do not perceive, however, that it is required by the matter in dispute. When a man takes a patent for an invention, which he claims to have made, his right to the monopoly is a question in which the public interest is deeply concerned, and every individual has a right to examine into the validity of his claim. One of the great objects of this Journal is to place before the public the facts which go to establish, or to impeach, the rights of patentees, and whether these be furnished by Mr. Sakmeister in his own name, or anonymously by "A Manufacturer," their value will be estimated by their intrinsic worth, and not by the signature which accompanies them.

We know that it is no pleasant thing for a man to have the justice of his claims questioned, but as every claim to a patent is a questionable one, it must either not be set up, or the consequence of

doing so must be borne. We should prefer to witness the triumph of Mr. Sakmeister in our court of inquiry, the Journal of the Franklin Institute, than in a court of law, where, in most cases, the contest terminates in loss to both the belligerents.

RECLAMATION.

Cast Iron Wheels, with Wrought Iron Spokes.

TO THE EDITOR OF THE JOURNAL OF THE FRANKLIN INSTITUTE.

In the number of your Journal for June last, you speak of a mode of casting wheels with wrought iron spokes, "*adopted by Mr. Perkins,*" and in your number for June, 1827, you published an extract from the Technical Repository, stating this mode to be the invention of Mr. Perkins. Mr. Perkins is certainly not entitled to the credit of the invention, for the writer of this article communicated it to Mr. Perkins, in London, in 1826, as the mode practised at Mauch Chunk, in making iron wheels for the wagons at that time used on the turnpike for conveying coal to the Lehigh, and Mr. Perkins had not known it previously. He no doubt communicated it to the editor of the Repository. H.

Philadelphia, July 3d, 1830.

On referring to the article in our number for June, 1827, the method of casting was, it appears, communicated by Mr. Perkins, but it is not stated to be his invention; it, however, appeared to be a fair inference that such was the case, and under this impression it has been so treated by us. It now appears that we were mistaken, and as we wish "honour to whom honour is due," we willingly insert the reclamation of our respected correspondent.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

Query. Gum Seed Lac. Shell Lac.

Mr. Editor,—Your correspondent desires to introduce to your notice the above articles, which are very extensively used in the manufactures of the United States for various purposes, viz. for stiffening hats water proof, for varnishes, for sealing wax, &c. and inquire through the medium of your Journal the relative value and properties of the two articles, as adapted to the above or any other purposes, and the modes of using them. It would doubtless much advance the manufactures of our country if the nature, properties and uses of prominent materials were more fully understood, and prevent much loss of time and money in fruitless experiments, by unskilful artists, and dissipate many prejudices created by ill success.

No doubt, among your numerous correspondents, there are those who are able and willing to add to the stock of useful knowledge disseminated by your valuable Journal; perhaps those in the constant use of the article would enlighten us in their respective application of them, and a mutual benefit be derived by

Many Manufacturers.

November 16, 1830.